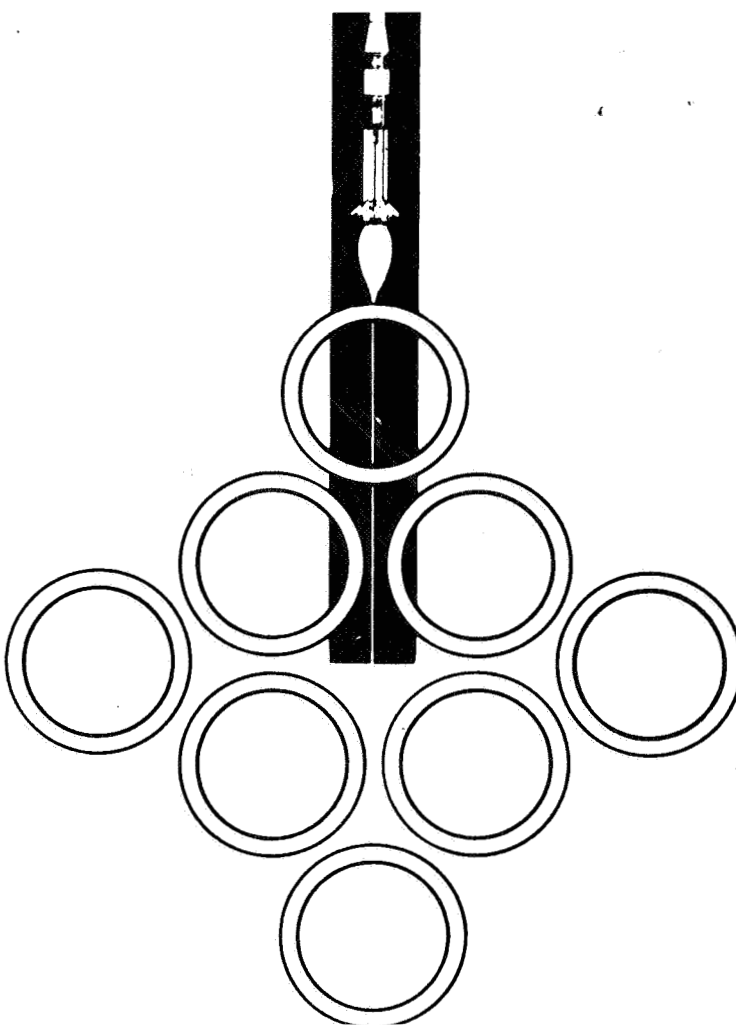


ENGINEERING DEPARTMENT
TECHNICAL REPORT

TR-RE-CCSD-FO-1105-3

March 29, 1967

SATURN IB PROGRAM



TEST REPORT
FOR

HAND OPERATED GATE VALVE

3-INCH, 150-PSIG

Alloy Products Company FIG. C-217-EB

NASA Drawing Number 75M04047 HGV-1

Facility Form 602

N67-36104

(ACCESSION NUMBER)	(THRU)	(DATE)	(CATEGORY)
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SPACE DIVISION



CHRYSLER
CORPORATION

TEST REPORT
FOR
HAND OPERATED **GATE** VALVE

3-INCH, 150 PSIG

Alloy Products Company FIG. C-217-EB

NASA Drawing Number 75M04047 HGV-1

ABSTRACT

This report presents the results of tests performed on one specimen of Hand Operated Gate Valve 75M04047 HGV-1. The following tests were performed:

- | | |
|-------------------------|------------------|
| 1. Receiving Inspection | 6. Icing |
| 2. Proof Pressure | 7. Sand and Dust |
| 3. Functional | 8. Salt Fog |
| 4. High Temperature | 9. Cycle |
| 5. Surge | 10. Burst |

The specimen successfully met the requirements of the John F. Kennedy Space Center throughout the test program, except for stem packing gland leakage.

The stem packing gland leakage occurred during the functional test while the specimen was in the icing environment. The packing gland was tightened and the icing test **was** repeated. No further leakage occurred after the packing gland was tightened.

TEST REPORT

FOR

2 HAND OPERATED GATE VALVE

3-INCH, 150-PSIG

Allay Products' Company FIG. C-217-EB

NASA Drawing Number 75M04047 HGV-1

/ March 29, 1967 /

/ CHRYSLER CORPORATION / SPACE DIVISION - NEW ORLEANS, LOUISIANA /

FOREWORD

The tests reported herein were conducted for the John F. Kennedy Space Center by Chrysler Corporation Space Division (CCSD), New Orleans, Louisiana. This document was prepared by CCSD under contract NAS 8-4016, Part VII, CWO 271620.

LIST OF ILLUSTRATIONS

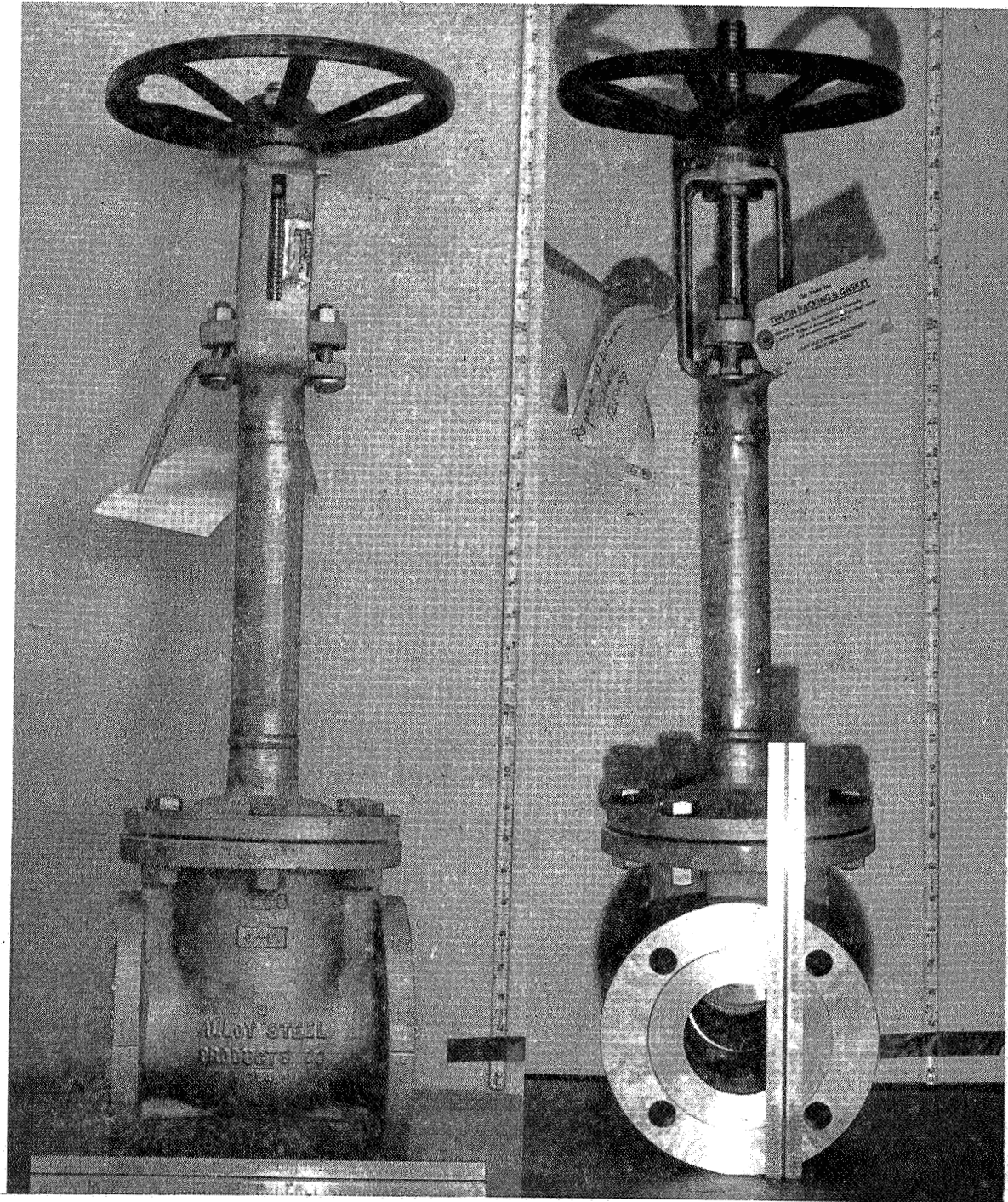
<u>Figure</u>		<u>Page</u>
FRONTISPIECE	vii
3-1	PROOF PRESSURE TEST SCHEMATIC	3-3
3-2	PROOF PRESSURE TEST SETUP	3-4
4-1	FUNCTIONAL TEST SCHEMATIC (GH ₂)	4-7
4-2	FUNCTIONAL TEST SCHEMATIC (LN ₂)	4-8
k-3	FUNCTIONAL TEST SETUP (GH ₂)	4-9
4-4	FUNCTIONAL TEST SETUP (LN ₂)	4-10
5-1	HIGH TEMPERATURE TEST SCHEMATIC	5-6
5-2	HIGH TEMPERATURE TEST SETUP	5-7
6-1	SURGE TEST SCHEMATIC	6-4
6-2	SURGE TEST SETUP	6-5
6-3	TYPICAL SURGE TEST WAVEFORM	6-6
7-1	ICING TEST SCHEMATIC	7-7
7-2	ICING TEST SETUP	7-8
8-1	SAND AND DUST TEST SETUP	8-3
9-1	SALT FOG TEST SETUP	9-3
9-2	SPECIMEN AFTER SALT FOG TEST	9-4
10-1	CYCLE TEST SCHEMATIC	10-5
10-2	CYCLE TEST SETUP	10-6
11-1	BURST TEST SCHEMATIC	11-3
11-2	BURST TEST SETUP	11-4

LIST OF TABLES

<u>Table</u>		<u>Page</u>
2-1	SPECIMEN SPECIFICATIONS	2-1
3-1	PROOF PRESSURE EQUIPMENT LIST	3-2
3-2	PROOF PRESSURE AND LEAKAGE TEST DATA	3-2
4-1	FUNCTIONAL TEST EQUIPMENT LIST	4-4
4-2	INITIAL FUNCTIONAL TEST DATA	4-6
5-1	HIGH TEMPERATURE TEST EQUIPMENT LIST	5-3
5-2	FUNCTIONAL TEST DATA DURING HIGH TEMPERATURE TEST	5-5
5-3	FUNCTIONAL TEST DATA AFTER HIGH TEMPERATURE TEST	5-5
6-1	SURGE TEST EQUIPMENT LIST	6-2
6-2	SURGE FUNCTIONAL TEST DATA AFTER 25 CYCLES	6-3
6-3	SURGE FUNCTIONAL TEST DATA AFTER 50 CYCLES	6-3
7-1	ICING TEST EQUIPMENT LIST	7-3
7-2	FUNCTIONAL TEST DATA AT ICING CONDITIONS (STEM PACKING GLAND LEAKAGE)	7-4
7-3	FUNCTIONAL TEST DATA AT AMBIENT CONDITIONS (STEM PACKING GLAND LEAKAGE)	7-4
7-4	FUNCTIONAL TEST DATA AFTER TIGHTENING STEM PACKINGGLAND	7-5
7-5	ICING FUNCTIONAL TEST DATA DURING ICING CONDITIONS	7-5
7-6	POST-ICING FUNCTIONAL TEST DATA	7-6
8-1	SAND AND DUST TEST EQUIPMENT LIST	8-2
8-2	POST-SAND AND DUST FUNCTIONAL TEST DATA	8-2
9-1	SALT FOG EQUIPMENT LIST	9-2
9-2	POST-SALT FOG FUNCTIONAL TEST DATA	9-2
10-1	CYCLE TEST EQUIPMENT LIST	10-2
10-2	CYCLE FUNCTIONAL TEST DATA AFTER 100 CYCLES	10-3
10-3	CYCLE FUNCTIONAL TEST DATA AFTER 500 CYCLES	10-3

LIST OF TABLES (Continued)

<u>Table</u>		<u>Page</u>
10-4	CYCLE FUNCTIONAL TEST DATA AFTER 1000 CYCLES	10-4
11-1	BURST TEST EQUIPMENT LIST.	11-2
11-2	BURST TEST DATA	11-2



Hand Operated Gate Valve 75MO4047 HGV-1, 3-inch,
150-psig

CHECK SHEET
FOR
HAND OPERATED GATE VALVE
3-INCH, 150 PSIG

MANUFACTURER: Alloy Steel Products Co., Linden, New Jersey
MANUFACTURER'S FIG.: C-217-EB
TESTING AGENCY: Chrysler Corporation Space Division, New Orleans, Louisiana
NASA DRAWING NUMBER: 75MO4047 HGV-1
AUTHORIZING AGENCY: NASA KSC

I, FUNCTIONAL REQUIREMENTS

- | | |
|------------------------|-----------------------------|
| A. OPERATING MEDIUM: | Liquid and gaseous hydrogen |
| B. OPERATING PRESSURE: | 150 psig |
| C. LEAKAGE: | |
| 1. Internal - | none at 100 psig |
| 2. External - | none at 100 psig |
| D. VALVE OPERATION: | Hand operated |

II. CONSTRUCTION

- | | |
|---|----------------------------|
| A. MATERIAL: | |
| 1. Body, Bonnet, and Trim - | Stainless steel type 316 |
| 2. Valve Stem - | Stainless steel type 304 |
| 3. Valve Packing and Valve Packing Seal | Teflon |
| B. CONNECTIONS: | 3-inch, 150-lb ASA flanges |

III. ENVIRONMENTAL REQUIREMENTS

- | | |
|-----------------------------|----------------|
| A. SAND, DUST, AND SALT FOG | |
| B. OPERATING TEMPERATURE: | +125 to -423°F |

- IV. LOCATION AND USE** Used as a vent valve in the LH₂ storage tank vent system at John F. Kennedy Space Center Launch Complexes 34 and 37B.

TEST SUMMARY
HAND OPERATED GATE VALVE,
75M04047-HGV1

Environment	Units	Operational Boundary	Test; Objective	Test Results	Remarks
Receiving Inspection		Comply with NASA drawing 75M04047-HGV-1 and vendor drawing number C-40984-4	Determine compliance with NASA and vendor drawings and examined for defects or poor workmanship.	Satisfactory	
Proof Pressure Test.		300 psig for 5 minutes	Maintain 300 psig	Satisfactory	Maintained 300 psig for 5 minutes. No leakage.
Functional Test		200 psig	Determine opening, seating and running torque valves. Determine internal & external leakage.	Satisfactory	No leakage
High Temperature Test,		125°F for 72 hours	Determine if specimen performance is impaired by high temperature.	Satisfactory	No leakage
Surge Test		0 to 200 psig in 100 milliseconds 50 cycles.	Determine if specimen performance is impaired by surging	Satisfactory	No leakage
Icing Test			temperature and ice		Stem leakage excessive at 5°F packing gland tightened. No further stem leakage. No internal leakage.
Sand and Dust Test		160°F temp, 0.5 gram per cu.fl. density, 500 ft per min. velocity.	Determine if specimen performance is impaired by sand and dust.	Satisfactory	

HAND OPERATED GATE VALVE

Environment	Units	Operational Boundary	Test Objective	Test Results	Remarks
Salt Fog Test		240 hours 95°F temp	Determine if specimen is impaired by salt fog.	satisfactory	
Cycle Test		1000 cycles	Determine if specimen is impaired by cycling.	satisfactory	
Burst Test		800 psig for 5 minutes and to failure pressure	Determine failure pressure and location.	Satisfactory	Inlet flange gasket failed at 3300 psig.

SECTION I

INTRODUCTION

1.1 SCOPE

This report presents the results of tests that were performed to determine if Hand Operated Gate Valve 75M04047 HGV-1 meets the operational requirements for John F. Kennedy Space Center Launch Complexes 34 and 37B. A **summary** of the test results **is** presented on pages ix and x.

1.2 ITEM DESCRIPTION

1.2.1 One specimen of Hand Operated Gate Valve 75M04047 HGV-1 **was** tested. The valve serves as a vent valve in the LH₂ storage tank vent system.

1.2.2 Hand Operated Gate Valve 75M04047 HGV-1 is a 3-inch valve with 158-pounds ASA raised-face flanges and is manufactured by Alloy Steel Products Company, Linden, New Jersey. Dimensionally the valve measures 11 1/8 inches face-to-face. The distance from the bottom of the flange to the top of the hand wheel is approximately 30 inches. The valve is hand operated and has an extension bonnet, O.S. and Y., bolted bonnet, retained gasket, rising stem, stationary hand wheel, double disc ball-and-socket type wedge and an integral seat. The valve has straight-through fluid flow.

1.3 APPLICABLE DOCUMENTS

The following documents contain the test requirements for Hand Operated Gate Valve 75M04047 HGV-1:

- a. KSC-STD-164(D), Standard Environmental Test Methods for Ground Support Equipment Installations at Cape Kennedy
- b. NASA Drawing 75M04047 HGV-1
- c. MSC Cleaning Standard 164
- d. Test Plan CCSD-FO-1105-1F
- e. Test Procedure TP-RE-CCSD-FO-1105-2F

SECTION II
RECEIVING INSPECTION

2.1 REQUIREMENTS

One specimen shall be **visually** and dimensionally inspected for conformance with the applicable specifications prior to testing.

2.2 PROCEDURE

A **visual** and dimensional inspection were performed to determine that the test specimen complied **with** NASA drawing number 75M04047 HGV-1 and the applicable vendor drawing number C-40984-4 to the extent possible without disassembly of the specimen. At the same time, the specimen **was** inspected for poor workmanship and manufacturing defects.

2.3 TEST RESULTS

The specimen complied with NASA drawing number 75M04047 HGV-1 and vendor drawing number C-40984-4. No evidence of poor workmanship or manufacturing defects were observed.

2.4 TEST DATA

The data presented in table 2-1 were recorded during the inspection.

Table 2-1. Specimen Specifics

Name	Hand Operated Gate Valve
Manufacturer	Alloy Products Company
Model Number	FIG. C-217-EB
Operating Pressure	150-psig
Face to Face	11½-inch
Connections	3-inch 150-lb ASA Flanges

SECTION III

PROOF PRESSURE TEST

3.1 TEST REQUIREMENTS

The test specimen shall be pressurized with GN₂ to a proof pressure of 300 psig. This pressure shall be maintained for 5 minutes and the specimen shall be checked for external leakage and distortion.

3.2 TEST PROCEDURE

3.2.1 The specimen was installed in the test setup as shown in figures 3-1 and 3-2 using the equipment listed in table 3-1.

3.2.2 All connections were tight, gages were installed and operating properly and all hand valves were closed.

3.2.3 Hand valves 3 and 7 were opened. Using regulated GN₂ supply source 2, and by adjusting regulator 6 while monitoring pressure gage 8, the specimen was pressurized to 300 psig.

3.2.4 Hand valve 7 was closed. The specimen was visually inspected for external leakage. Gage 8 was monitored for 5 minutes and the initial and final pressures were recorded.

3.2.5 Hand valve 3 was closed and the specimen and system were vented by opening hand valves 7 and 9.

3.3 TEST RESULTS

No specimen leakage was observed and there was no evidence of distortion.

3.4 TEST DATA

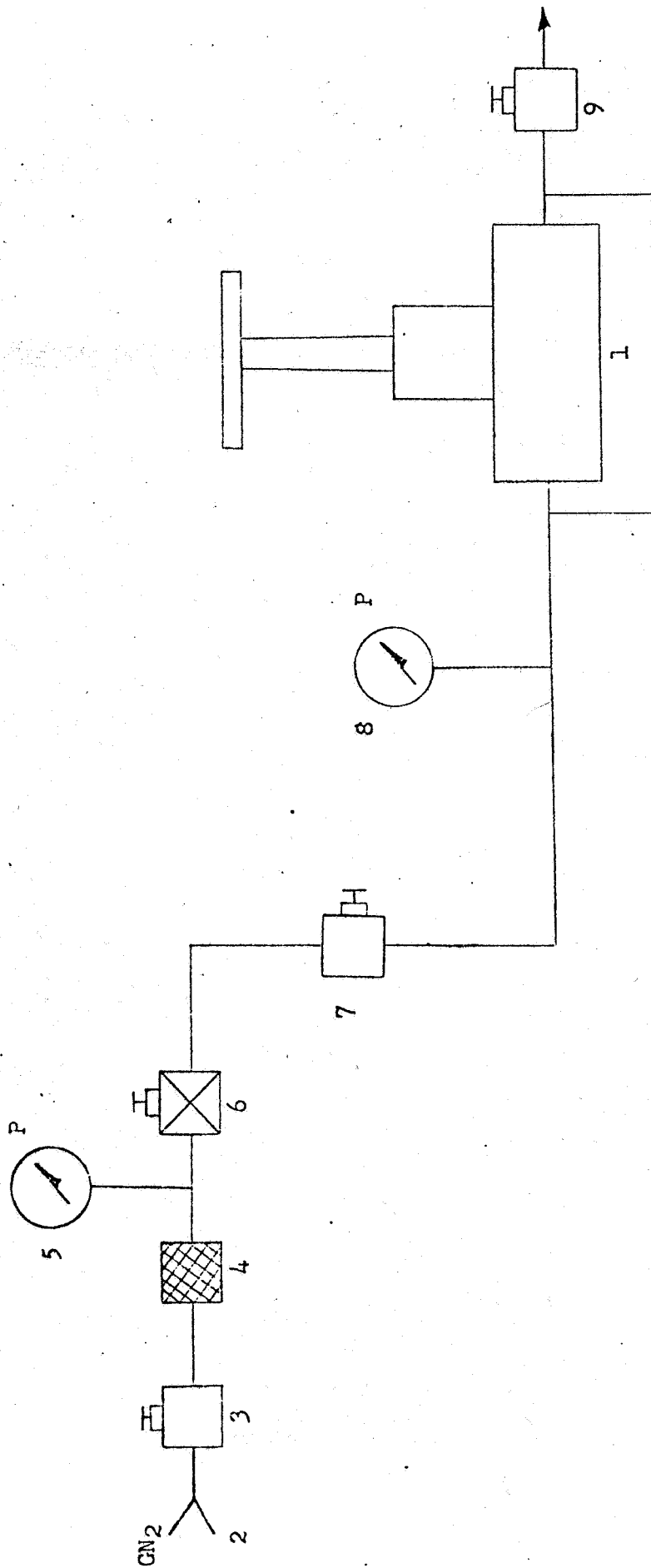
The data presented in table 3-2 were recorded during this test.

Table 3-1. Proof Pressure Test Equipment List

Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
1	Test Specimen	Alloy Steel Products Co.	FIG. C-217-EB	NA	3-inch, 150-psig gate valve
2	GN ₂ Supply Source	CCSD	N/A	NA	0-to 1500-psig
3	Hand Valve	Robbins	SS-NG 250-4T		1/4-inch
4	Filter	Bendix	2-S-1346 16-13-0	- 60	2-micron
5	Pressure Gage	Ashcroft	1279	NASA NR	0-to 500-psig ±0.5% FS Cal date 12-28-66
6	Pressure Regulator	Tescom	26-1003	1001	0-to 3000-psig inlet 0-to 500-psig outlet
7	Hand Valve	Robbins	SS-NG- Z50-4T	NA	1/4-inch
8	Pressure Gage	Heise	H-35828	NASA NR. 200617-E	0-to 500-psig ±0.5% FS Cal date 12-28-65
9	Hand Valve	Robbins	SS-NG- 250-4T	NA	1/4-inch

Table 3-2. Proof Pressure and Leakage Test Data

Initial pressure reading	300 psig at the start of 5 minutes
Final pressure reading	300 psig at the end of 5 minutes
Leakage	None
Mstortion	None



Note: All lines 1/4 inch
Refer to table 3-1 for item identification.

Figure 3-1. Proof Pressure Test Schematic

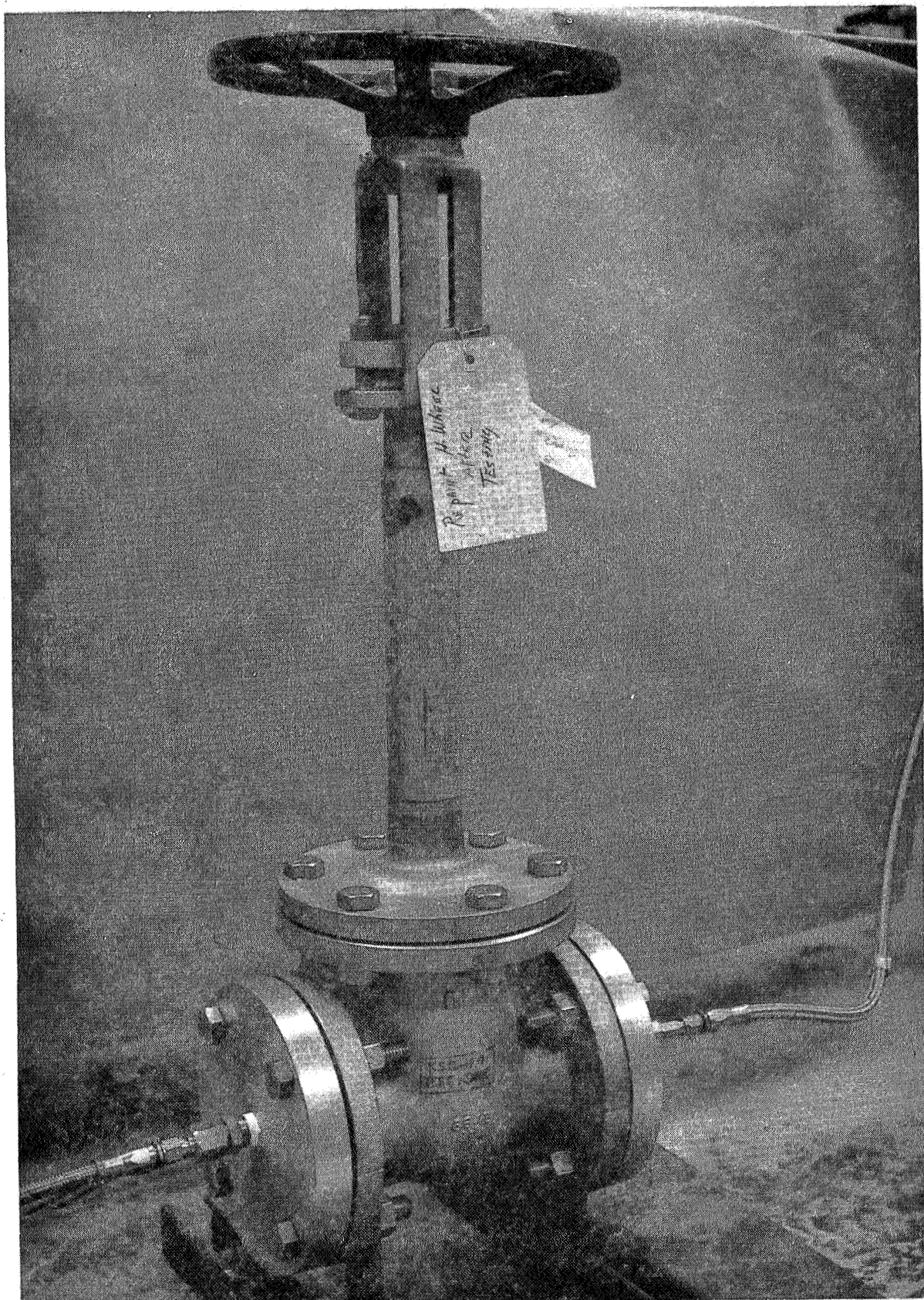


Figure 3-2. Proof Pressure Test Setup

SECTION IV
FUNCTIONAL TEST

4.1 TEST REQUIREMENTS

4.1.1 TEST WITH GH₂

4.1.1.1 The test specimen shall be closed and the inlet port pressurized to 100 psig with GH₂. The specimen shall be checked for external and internal leakage.

4.1.1.2 Repeat the procedure described in paragraph ~~4.1.1~~ using an inlet port pressure of 200 psig.

4.1.2 TEST WITH LN₂

4.1.2.1 The ~~manual~~ handwheel ~~shall~~ be removed ~~from~~ the specimen and replaced with a torque wrench. The specimen shall be pressurized to 200 psig with LN₂ and the torque required to open and close the valve shall be recorded. The breakaway torque and the torque required to keep the stem moving ~~shall~~ also be recorded.

4.1.2.2 The procedures described in paragraphs ~~4.1.1~~ through 4.1.2.1 shall be repeated three times for the initial functional test and for all subsequent functional tests.

4.2 TEST PROCEDURE

4.2.1 TEST WITH GH₂

4.2.1.1 The specimen ~~was~~ installed in the test setup as shown in figure 4-1 and 4-3 using the equipment listed in table 4-1. The specimen ~~was~~ cycled from the fully open to the fully closed position several times, ensuring that the specimen ~~was~~ operating properly.

4.2.1.2 A $\frac{1}{4}$ -inch flex hose ~~was~~ connected to the outlet port of the specimen (~~maximum~~ length allowed for the flex hose ~~was~~ 12 inch). Lab tray 21 ~~was~~ filled with H₂O and the flex hose ~~was~~ placed in the lab tray.

4.2.1.3 All connections were tight, gages were installed and ~~Were~~ operating properly, and all ~~hand~~ valves ~~Were~~ closed. A graduated tube filled with H₂O ~~was~~ placed inverted in the lab tray 21 as shown in figure 4-1.

4.2.1.4 The specimen and hand valves 7 and 22 ~~were~~ opened and by adjusting regulator 6 a complete system and specimen purge ~~was~~ performed to ensure that all oxidizing gases ~~were~~ removed from the system and specimen. Regulator 6 ~~was~~ readjusted and hand valves 7 and 22 were closed thus trapping a ~~minimum~~ 15 psig of GN₂ in the system.

- 4.2.1.5 Hand valves 19 and 22 were opened, regulator 17 was adjusted to 20 psig of GH_2 as indicated on gage 18, and the system was purged of GN_2 . When a pure hydrogen atmosphere was reached in the system, the specimen and all hand valves were closed.
- 4.2.1.6 Hand valve 22 was opened and then closed venting any trapped pressure at the specimen outlet. Hand valve 23 was opened.
- 4.2.1.7 Hand valve 19 was opened and regulator 17 was adjusted to pressurize the inlet of the specimen to 100 psig as indicated on gage 18. External leakage was visually checked with a leak-age detector. No external leakage was allowed. Internal leak-age was checked by monitoring lab tray 21. All data was recorded.
- 4.2.1.8 The procedure described in 4.2.1.7 was repeated with specimen inlet pressure of 200 psig. All data were recorded.
- 4.2.1.9 Regulator 17 was readjusted to zero outlet pressure and hand valves 19 and 23 were closed. Specimen and hand valves 7 and 22 were opened. Regulator 6 was adjusted to perform a 20 psig GN_2 purge of the specimen and complete system. The 20 psig was monitored on gage 8. Hand valve 23 was slightly opened allowing the flex hose to be purged. Upon completion of the purge all hand valve were closed and the specimen was removed from the setup.
- 4.2.2 TEST WITH LN₂
- k.2.2.1 The specimen was installed in the test setup as shown in figures 4-2 and 4-4 using the equipment listed in table 4-1.
- 4.2.2.2 All connections were tight, gages were installed and operating properly, and all hand valves were closed.
- 4.2.2.3 The manual handwheel was removed from the specimen and was replaced with torque wrench 13.
- 4.2.2.4 The LN₂ bath 8 was filled with LN₂. Specimen and hand valves 3 and 7 were opened and hand valve 14 was cracked. Regulator 6 was adjusted to a downstream pressure of 200 psig as indicated on gage 10. When a temperature of -320°F was indicated at the inlet of the specimen by therm—couple 12 the specimen was closed. Regulator 6 was readjusted, pressurizing the specimen inlet to 200 psig as was indicated on gage 10. Thermocouple 12 was continuously monitored to ensure that a temperature of -320°F was maintained.
- 4.2.2.5 The specimen was opened and closed using torque wrench 13. The torque required to open the specimen and to seat the specimen closed was recorded. The break-away torque and the torque required to keep the stem moving were recorded.
- 4.2.2.6 Hand valve 3 was closed and hand valves 11 and 14 were opened and the system and specimen was vented to zero pressure.

4.3

TEST RESULTS

The specimen demonstrated satisfactory operation during the initial functional test.

4.4.

TEST DATA

The data presented in table 4-2 were recorded during the initial functional test.

Table 4-1. Functional Test Equipment List

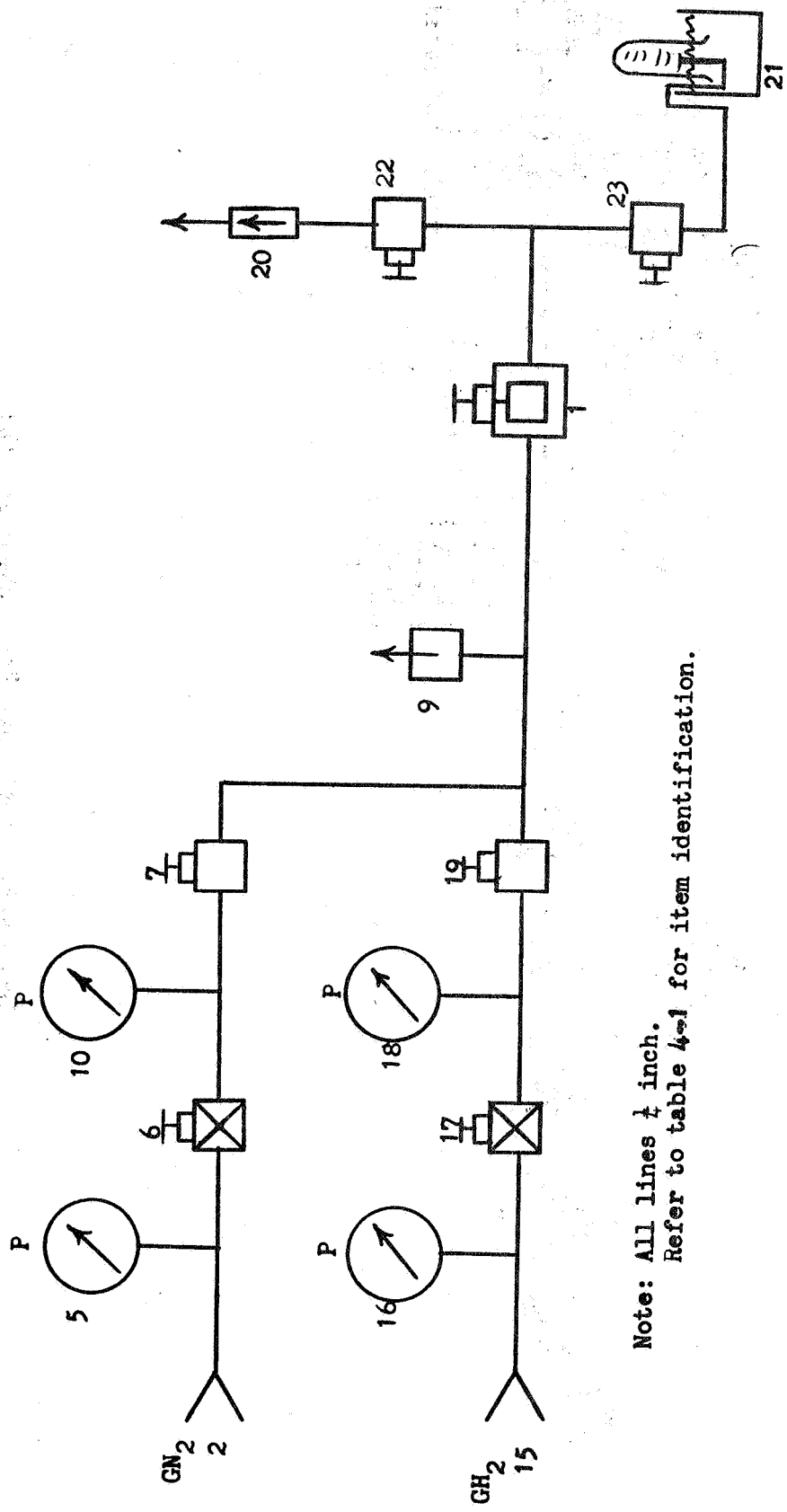
Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
1	Test Specimen	Alloy Steel Products Co.	PIG, C-217-EB	NA	3-inch, 150 psig gate valve
2	GN ₁ Pressure Source	CCSD	NA	NA	0-to 3000-psig
3	Hand Valve	Robbins	SSKE-250-4T	MA	1/4-inch
4	Filter	Bendix	1731260	NA	2-micron
5	Pressure Gage	Heise	H-35830	NA	0-to 500-psig ±0.5% FS Cal date 11/10/66
6	Regulator	Tescom	26-1023	1038	0-to 3000-psig inlet 0-to 500-psig outlet
7	Hand Valve	Hoke	PY271	NA	1/4-inch
8	LN ₂ Bath	Roman and Kunzi Co.	LOX 13	NA	
9	Relief Valve	Anderson-Greenwood	81B-66-6	2364-S	1/2-inch, 500-psig
10	Pressure Gage	Heise	H-35842	NA	0-to 500-psig ±0.5% FS Cal date 11-10-66
11	Hand Valve	Hydcomatics	NA	NA	1/4-inch
12	Thermocouple	West	IES33	NASA 019461	± 2°F accuracy Cal date 10-31-66
13	Torque wrench				
14	Hand Valve	Flowmatics	NA	NA	1/2-inch
15	GH ₂ Pressure Source	CCSD	NA	NA	0-to 300-psig

Table 4-1. Functional Test Equipment List (Con't.)

Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
16	Pressure Gage	Union Carbide	NA	NA	0-to 3500-psig No cal date required
17	Regulator	Union Carbide	NA	NA	0-to 3500-psig
18	Pressure Gage	Duragage	NA	NASA 95- 1612-B	0-to 600-psig ± 0.5% FS Cal date 10-24-66
19	Hand Valve	Robbins	SSKG- 250-4T	NA	1/4-inch
20	Check Valve	Republic Mfg. Co.	NA	NA	1/4-inch
21	Leak Detector	CCSD	NA	NA	50cc graduated tube and lab tray.
22	Hand Valves	Robbins	SSKG 250-4T	NA	1/4-inch
23	Hand Valve	Robbins	SSKG 250-4T	NA	1/4-inch

Table 4-3. Initial Functional Test Data

Checks	Inlet Pressure	Results
External leakage	100-psig/GH ₂	None
External leakage	200-psig/GH ₂	None
Internal leakage	100-psig/GH ₂	None
Internal leakage	200-psig/GH ₂	None
Opening torque	200-psig/LN ₂	10 ft/lbs
Seating torque	200-psig/LN ₂	20 ft/lbs
Stem <i>running</i> torque	200-psig/LN ₂	Less than 1 ft/lb.



Note: All lines $\frac{1}{4}$ inch.
Refer to table 4-1 for item identification.

Figure 4-1. Functional Test Schematic (GH₂)

Note: All lines $\frac{1}{4}$ inch unless otherwise indicated.
Refer to table 4-1 for item identification.

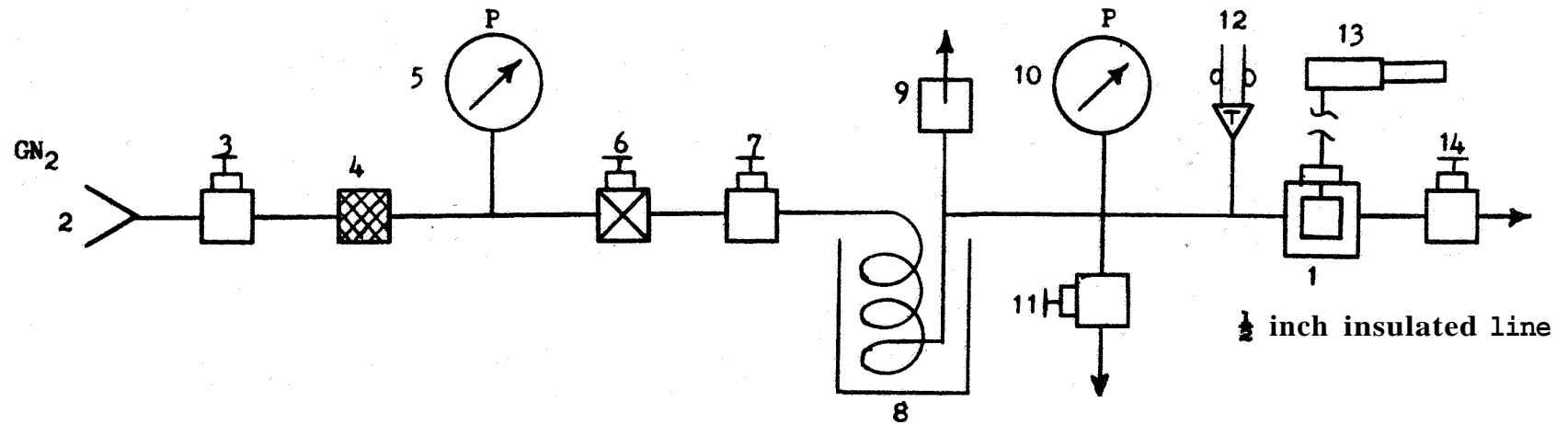


Figure 4-2, Functional Test Schematic (LN₂)

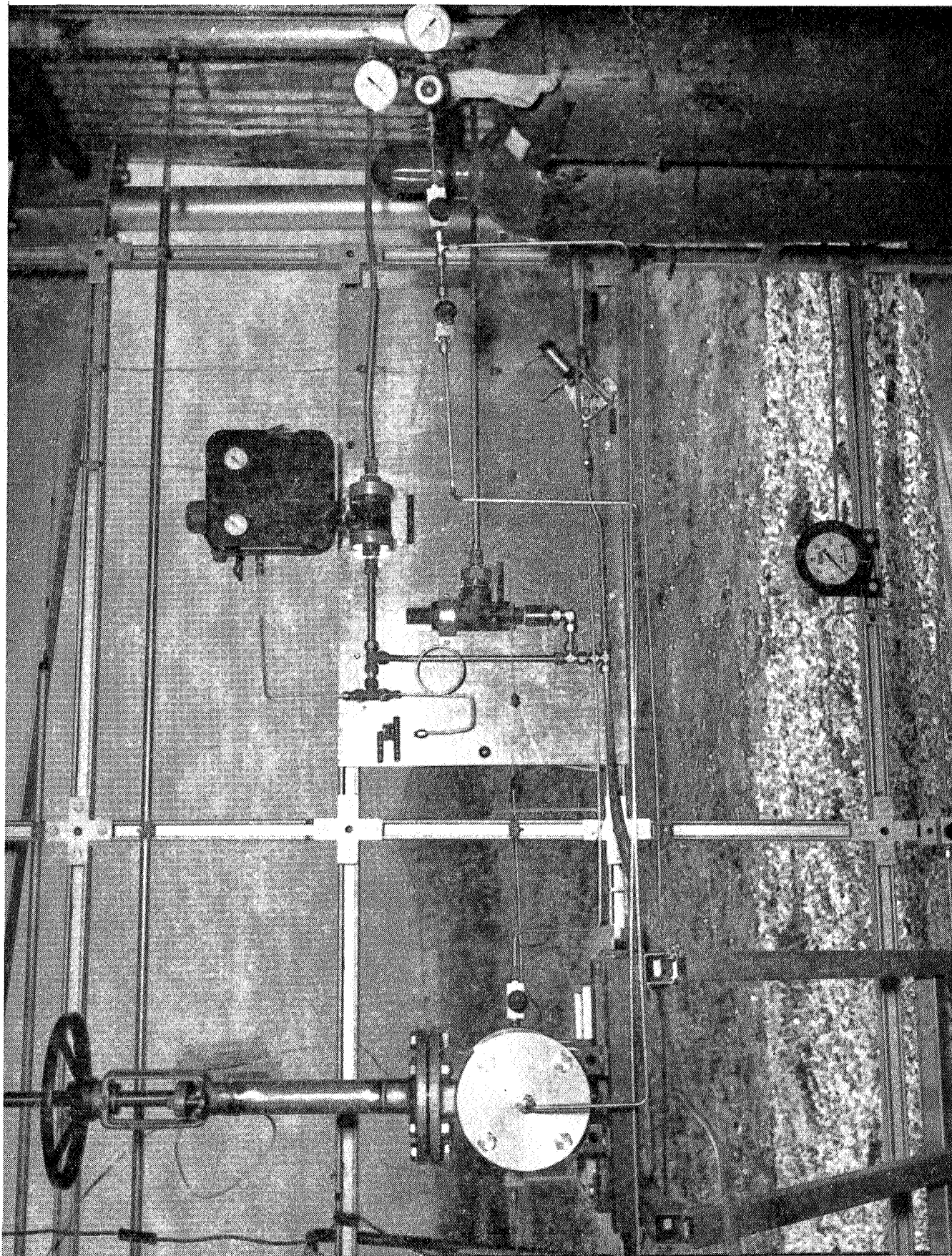


Figure 4-3. Additional Test Setup (GH₂)

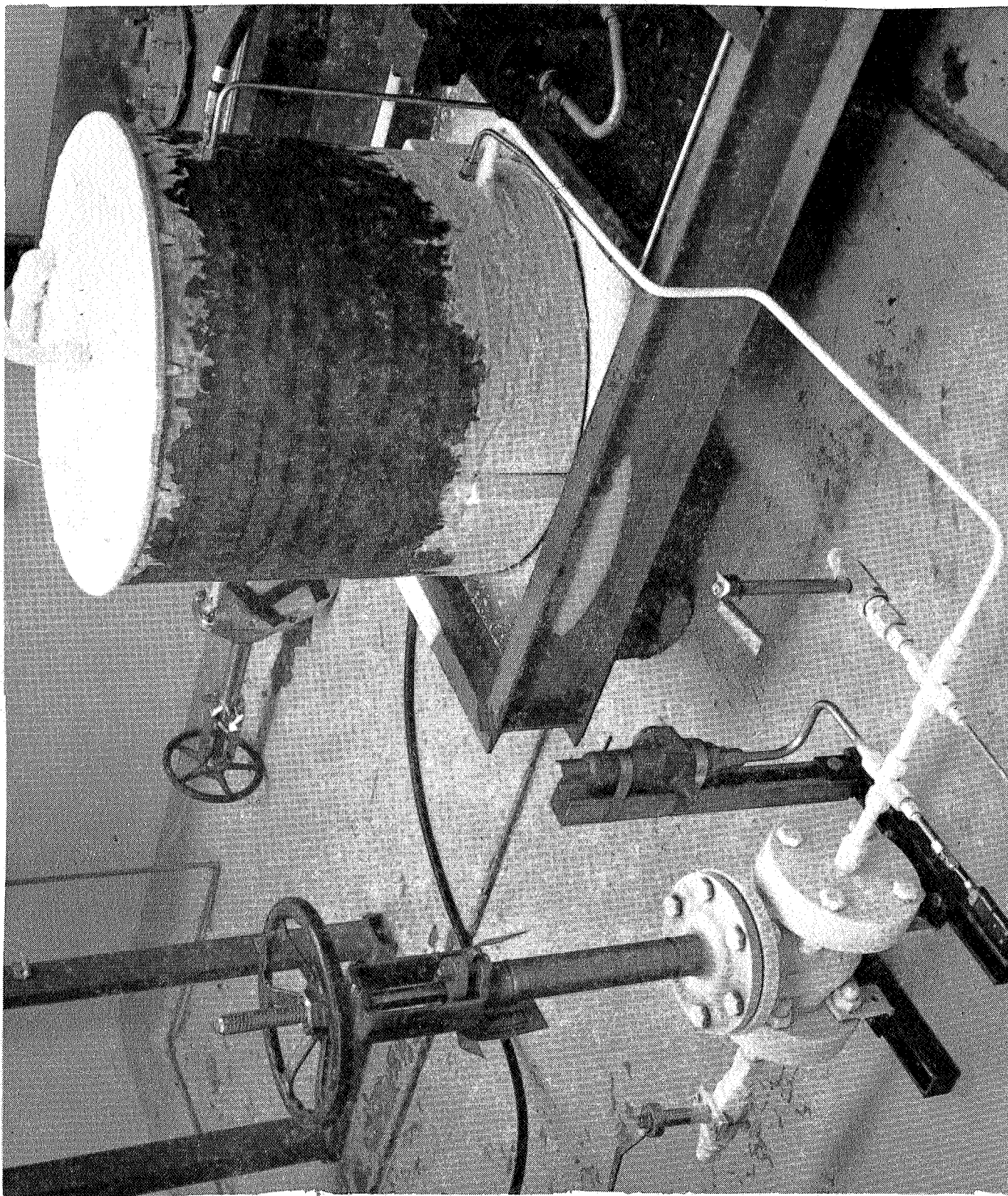


Figure 4-4. Functional Test Setup (LN2)

SECTION V

HIGH TEMPERATURE TEST

5.1

TEST REQUIREMENTS

- 5.1.1 A high temperature test **shall** be conducted on the test specimen in accordance with section 6, KSC-STD-164(D), procedure I.
- 5.1.2 The temperature of the specimen **shall** be stabilized at 125 (+4, -0)°F for 72 hours.
- 5.1.3 The relative humidity **shall** be maintained at 20 (+5) per cent.
- 5.1.4 A functional test shall be performed during and after the high temperature test using LH₂ as the test medium.

5.2

TEST PROCEDURE

- 5.2.1 The specimen **was** installed in the test setup as **shown** in figures 5-1 and 5-2 using the equipment listed in table 5-1. Thermocouple 18 **was** mounted to the surface of the specimen.
- 5.2.2 The specimen temperature **was** maintained at 125 (+4-0)°F for 72 hours. The relative humidity of the temperature chamber **was** maintained at 20 (+5) per cent during this 72 hour period. The temperature of the specimen **was** monitored on therm—couple 18.
- 5.2.3 A $\frac{1}{4}$ -inch flex hose **was** connected to the outlet port of the specimen. Leak detector 22 **was** filled with water and installed. All connections were tight, gages were installed and operating properly and all hand valves were closed.
- 5.2.3 The specimen and hand valves 8 and 19 were opened. By adjusting regulator 6 a complete system and specimen purge **was** performed with GN₂, to ensure, that all oxidizing gases **were** removed from the system and specimen. Regulator 6 **was** readjusted and hand valve 8 and 19 were closed trapping a minimum 15 psig GN₂ in the system.
- 5.2.4 Hand valves 12 and 19 were opened and regulator 10 **was** adjusted to provide a 20 psig GH₂ system purge pressure as indicated **by** gage 11. The GH₂ purge removed the GN₂ from the system. The specimen and hand valves 12 and 19 were closed after a hydrogen atmosphere had been achieved.
- 5.2.4 Hand valve 19 **was** opened and then closed venting **any** trapped pressure at the outlet port of the specimen. Hand valve 21 **was** opened.
- 5.2.5 Hand valves 13 and 16 were opened and **by** regulating LH₂ source 4 the specimen **was** pressurized to 100 psig as indicated on gage 15.

- 5.2.6 The internal leakage of the specimen **was** checked **by** monitoring leak detector 22. No internal leakage **was** allowed. Data were recorded.
- 5.2.7 Hand valve 16 **was** closed, hand valve 12 **was** opened and regulator 10 **was** adjusted pressurizing the inlet of the specimen to 200 psig CH_2 . The pressure **was** monitored on gage 11.
- 5.2.8 The internal leakage of the specimen **was** checked as described in 5.2.6.
- 5.2.9 Regulator 10 **was** readjusted to zero psig outlet pressure. Hand valve 12 **was** closed. The specimen and hand valve 19 **was** opened and the system **was** vented of CH_2 .
- 5.2.10 Hand valve 8 **was** opened, regulator 6 **was** adjusted and a 20 psig CH_2 purge of the specimen and complete system **was** performed. Pressure **was** monitored on gage 7. Hand valve 21 **was** slightly opened and the flex hose **was** purged. Upon completion of the purge all hand valves were closed.
- 5.2.11 Upon completion of 72 hours at high temperature the temperature chamber **was** returned to ambient conditions.
- 5.2.12 Within 1 hour after completion of the high temperature test a **visual** inspection of the specimen for degradation and deformation **was** performed. Also test as described in 5.2.3 through 5.2.10 **was** performed while maintaining the temperature at ambient conditions.

5.3 TEST RESULTS

The specimen demonstrated satisfactory operation during the high temperature functional test and on the post-high temperature functional test.

54 TEST DATA

The data presented in table 5-2 and 5-3 were recorded during the high temperature function test on the post-high temperature functional test.

Table 5-1. High Temperature Test Equipment List

Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
1	Test Specimen	Alloy Steel Products Co.	FIG. C-217-EB	NA	3-inch, 150-psig gate valve
2	Cn ₂ Pressure Source	CCSD	NA	NA	0-to 300-psig
3	CH ₂ Pressure Source	CCSD	NA	NA	0-to 300-psig
4	LH ₂ Pressure Source	CCSD	NA	NA	0-to 300-psig
5	Pressure Gage	Heise	H-35830	NA 0.5%	0-to 500-psig ± 0.5% FS Cal date 11-10-66
6	Regulator	Tescon	26-1023	1038	0-to 3000-psig inlet 0-to 500-psig outlet
7	Pressure Gage	Heise	H-35842	NA	0-to 500-psig ± 0.5% FS Cal date 11-10-66
8	Hand Valve	Hoke	NA	NA	1/4-inch
9	Pressure Gage	Victor	R-895664-1		0-to 400-psig No Cal date req
10	CH ₂ Regulator	Union Carbon Co. Linde	NA	NA	0-to 500-psig outlet
11	Pressure Gage	Marsh	NA	NASA 94-1147-B	0-to 600-psig ± 0.5% FS Cal date 10-12-66
12	Hand Valve	Flowmatics	NA	NA	1/4-inch
13	Hand Valve	Control Components	ES-6004-P-P-6000-psig	NA	1/4-inch

Table 5-1. High Temperature Test Equipment List (Con't)

Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
14	Filter	Bendix	1731260	NA	2-micron
15	Pressure Gage	Duragage	NA	NASA 95-1612-B	0-600-psig ± 0.5% FS Cal date 10-24-66
16	Hand Valve	Control Components	ES-6004-P-P-6000 psig	NA	1/4-inch
17	Relief Val.	Anderson Greenwood	NA	2364-S	1/2-inch, 500-psig
18	Thermocouple	Honeywell	NA	NA	
19	Hand Valve	Control Com-	ES-6004-P-P-6000 psig	NA	1/4-inch
20	Check Valve	Republic Mfg. Co.	NA	NA	1/4-inch
21	Hand Valve	Control Components	ES-6004-P-6000- psig	NA	1/4-inch
22	Leak Detector	CCSD	NA	NA	50-cc
23	Icing Chamber	CCSD	NA	NA	

Table 5-2. Functional Test Data During High Temperature Test

Tests	Inlet Pressure	Results
Internal leakage	100 psig/LH ₂	None
Internal leakage	200 psig/GH ₂	None

Table 5-3. Functional Test Data After High Temperature Test

Tests	Inlet Pressure	Results
Internal leakage	100 psig/LH ₂	None
Internal leakage	200 psig/GH ₂	None

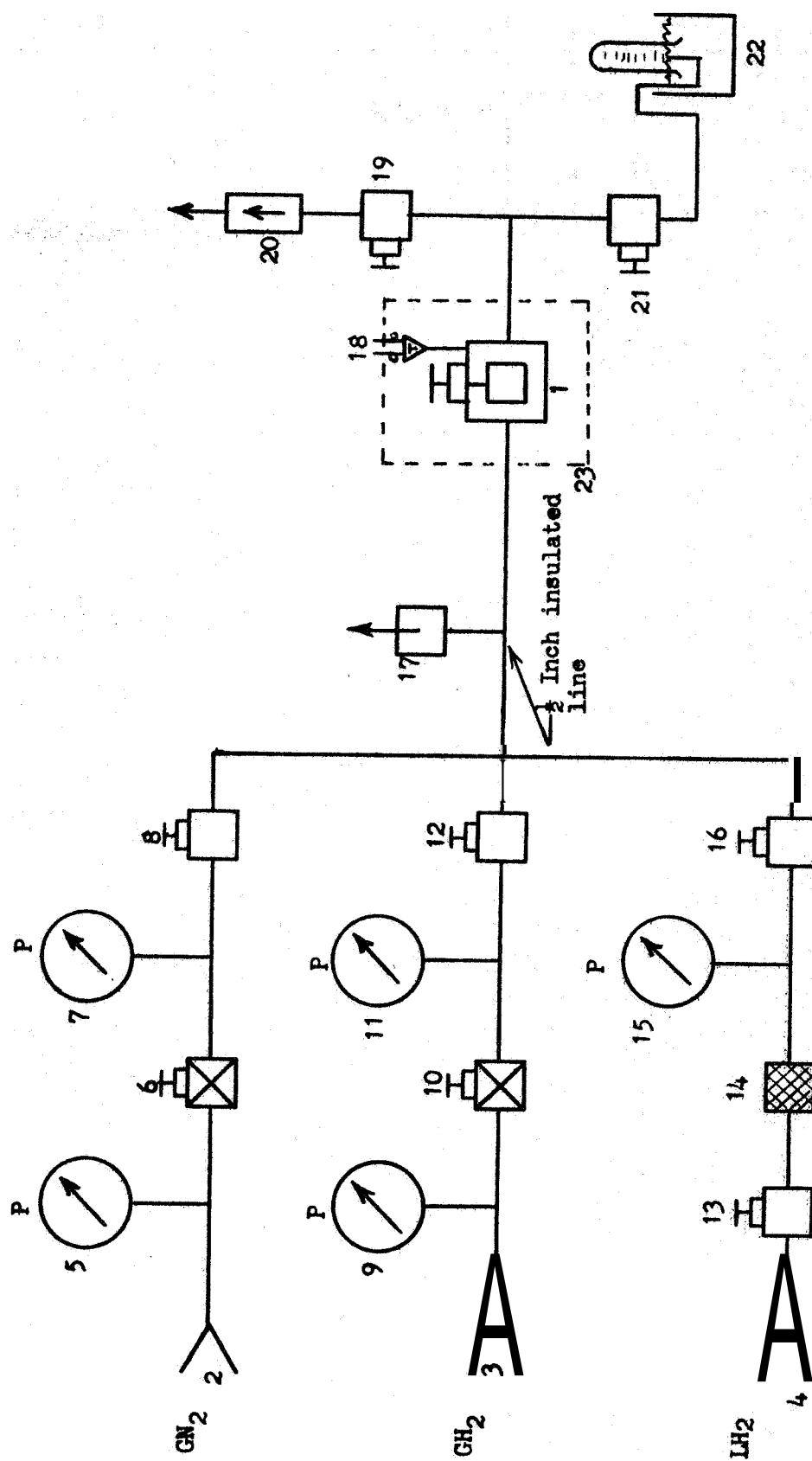


Figure 5-1. High Temperature Test Schematic

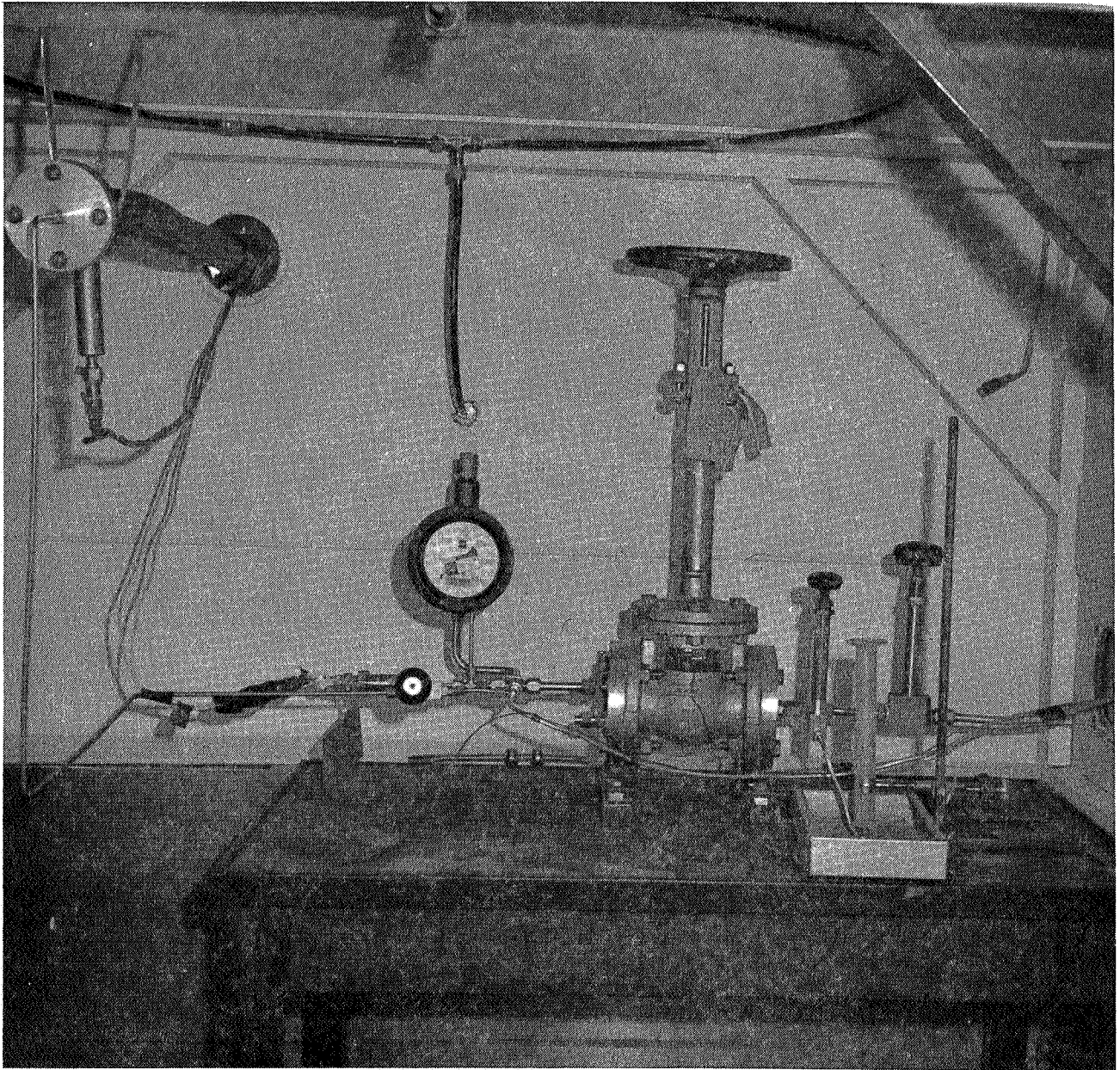


Figure 5-2. High Temperature Setup

SECTION VI

SURGE TEST

6.1 TEST REQUIREMENTS

- 6.1.1 The specimen shall be closed and the inlet port **shall** be pressurized from 50 (+5, -0) psig to 200 (+5, -0) psig within 100 milliseconds. This constitutes one surge cycle. A total of 50 cycles shall be performed using LN₂ as the pressurizing medium,
- 6.1.2 A functional test as described in section IV **shall** be performed after 25 and 50 cycles.

6.2 TEST PROCEDURE

- 6.2.1 The specimen **was** installed in the test setup as shown in figure 6-1 and 6-2 using the equipment listed in table 6-1,
- 6.2.2 All connections were tight, gages were installed operating properly, and **all** hand valves, solenoid valves, and specimen were closed.
- 6.2.3 LN₂ bath 8 **was** filled. GN₂ supply source 2 **was** adjusted to 250 psig. Hand valves 3 and 7 and solenoid valves 11 and 12 were opened. Regulator 6 **was** adjusted to 200 psig, as indicated on gage 9. When LN₂ flowed from the outlet, of solenoid valve 12, solenoid valves 11 and 12 were closed;
- 6.2.4 Solenoid valve 11 **was** opened and the inlet of the specimen **was** pressurized from 50 to 200 psig. Solenoid valve 11 **was** closed and solenoid valve 12 **was** opened and the inlet of the specimen **was** vented to zero pressure. Solenoid valves 11 and 12 were controlled by timer 5.
- 6.2.5 Regulator 6 **was** adjusted until the pressurizing rate from 50 to 200 psig **was** within 100 milliseconds as indicated on oscillograph 14.
- 6.2.6 The procedure described in 6.2.4 constituted 1 cycle. A total of 50 cycles were performed.
- 6.2.7 A functional test **was** conducted as specified in section IV after 25 and 50 cycles.

6.3 TEST RESULTS

The specimen demonstrated satisfactory operation during the surge functional test after 25 and 50 cycles of surge.

6.4 TEST DATA

The data presented in tables 6-2 and 6-3 were recorded during the surge functional test after 25 and 50 cycles of surge. A typical surge plot is **shown** in figure 6-3.

Table 6-1. Surge Test Equipment List

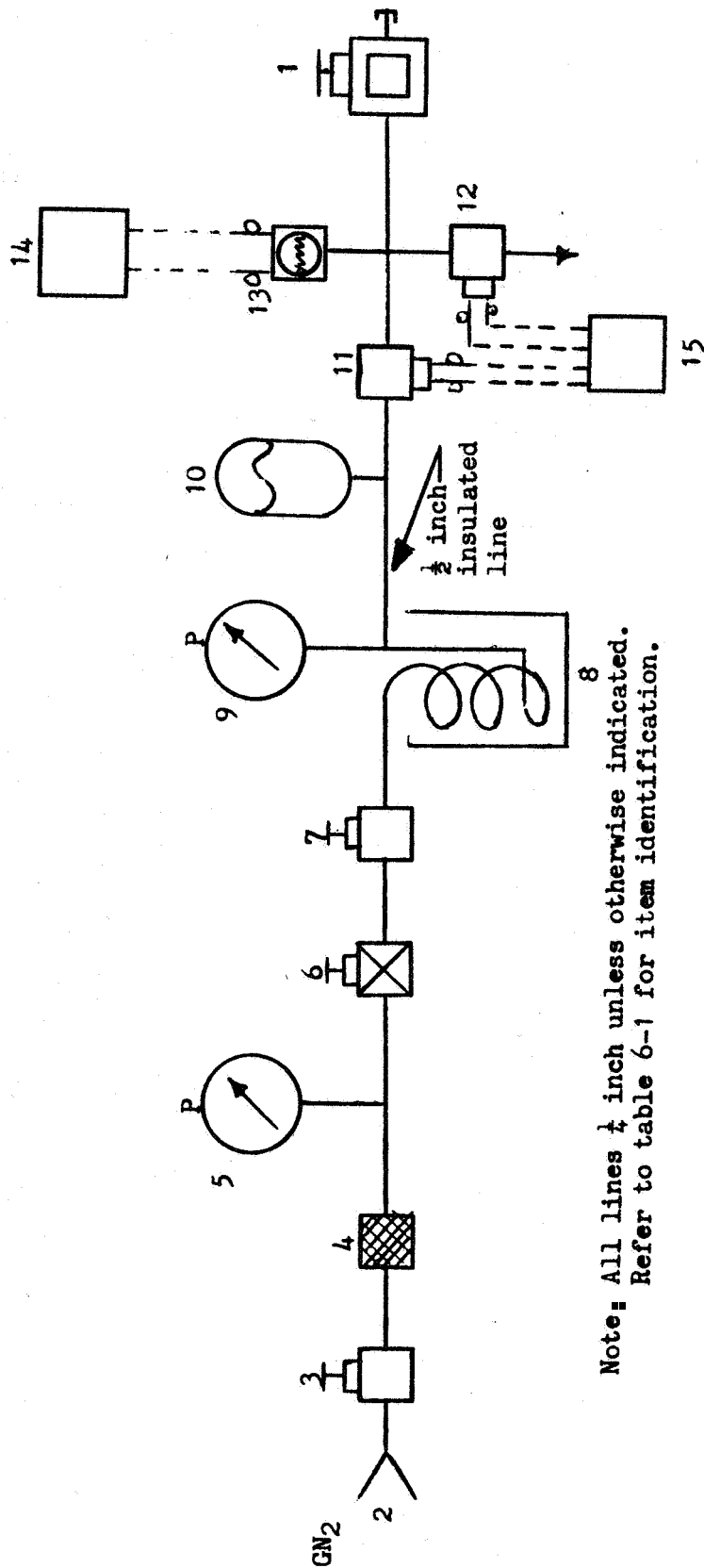
Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
1	Test Specimen	Allay Steel Products Co.	FIG. C-217-E	NA	3-inch, 150-psig gate valve
2	GN₂ Pressure Source	CCSD	NA	NA	0-to 300-psig
3	Hand Valve	Hoke	HY271	NA	1/4-inch
4	Filter	Bendix	1731260	NA	2-micron
5	Pressure Gage	Heise	H-35830	NA	0-to 500-psig ±0.5% FS Cal date 11-10-66
6	Regulator	Tescom	26-1023	1038	0-to 3000-psig inlet 0-to 500-psig outlet
7	Hand Valve	Flowmatic	NA	NA	1/4-inch
8	LN₂ Bath		81B-66-6	23645	
9	Pressure Gage	Heise	H-35842	NA	0-to 500-psig ±0.5% FS Cal date 11-10-66
10	Accumulator	Parker	NA	NA	
11	Solenoid Valve	Asco	703351	NA	1/2-inch
12	Solenoid Valve	Asco	70335N	NA	1/2-inch
13	Pressure Transducer	Consolidated Electrodynamics Corporation	4-350-0001	95-1320-B	0-to 500-psia 0.5% accuracy Cal date 2-27-67
14	Oscillograph	Consolidated Electro Dynamic Corp.		NASA 12586	Cal date 1-30-67
15	Timer	Wilson	1	NA	

Table 6-2. Surge Functional Test Data After 25 Cycles

Checks	Inlet Pressure	Results
External leakage	100-psig/GH ₂	None
External leakage	200-psig/GH ₂	None
Internal leakage	100-psig/GH ₂	None
Internal leakage	200-psig/GH ₂	None
Opening torque	200-psig/LN ₂	19 ft/lbs
Seating torque	200-psig/LN ₂	32 ft/lbs
Stem running torque	200-psig/LN ₂	1 ft/lb.

Table 6-3. Surge Functional Test Data After 50 Cycles

Checks	Inlet Pressure	Results
External leakage	100-psig/GH ₂	None
External leakage	200-psig/GH ₂	None
Internal leakage	100-psig/GH ₂	None
Internal leakage	200-psig/GH ₂	None
Opening torque	200-psig/LN ₂	20 ft/lbs
Seating torque	200-psig/LN ₂	35 ft/lbs
Stem running torque	200-psig/LN ₂	1 ft/lbs



Note: All lines $\frac{1}{2}$ inch unless otherwise indicated.
Refer to table 6-1 for item identification.

Figure 6-1. Surge Test Schematic

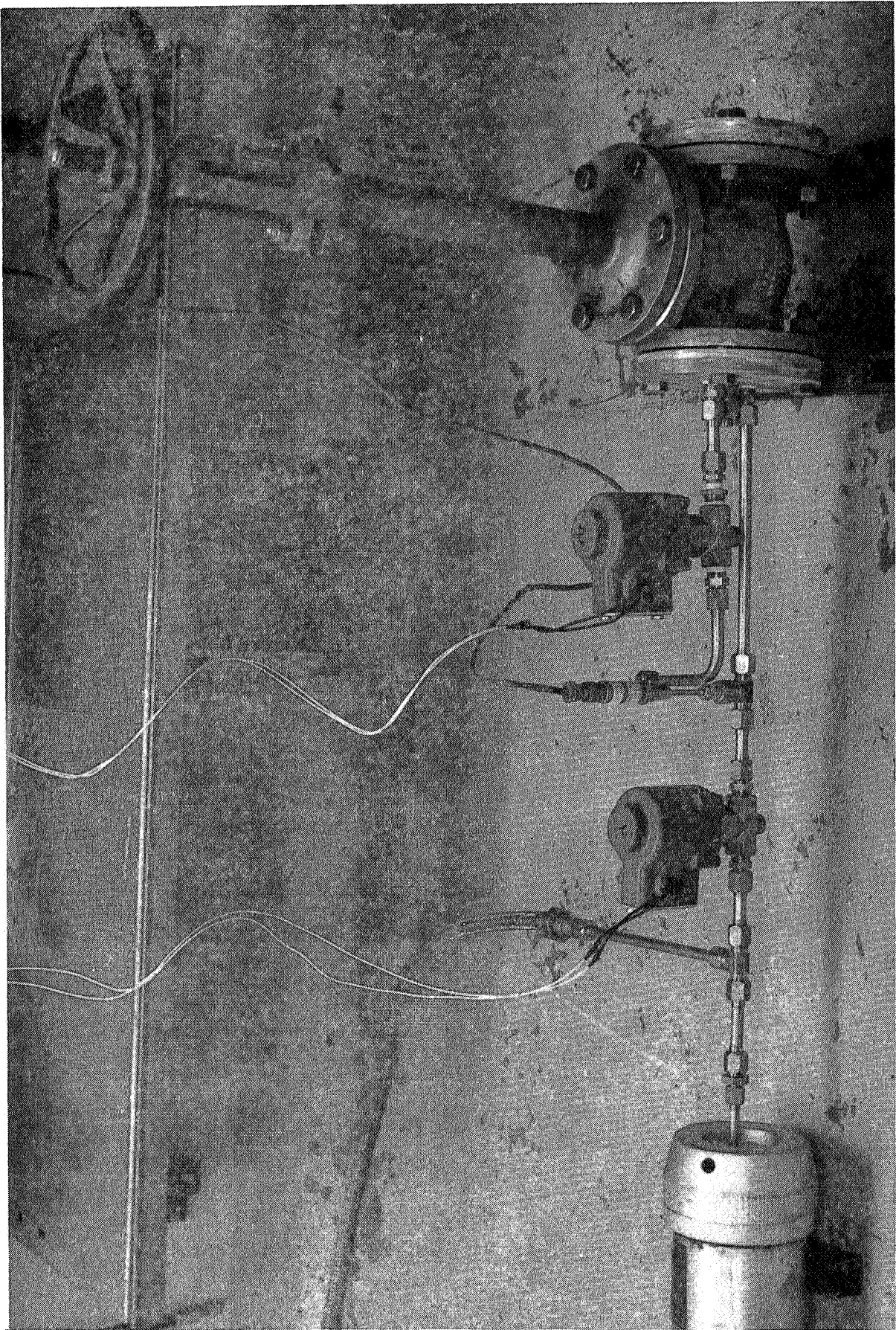


Figure 6-2. Surge Test Setup

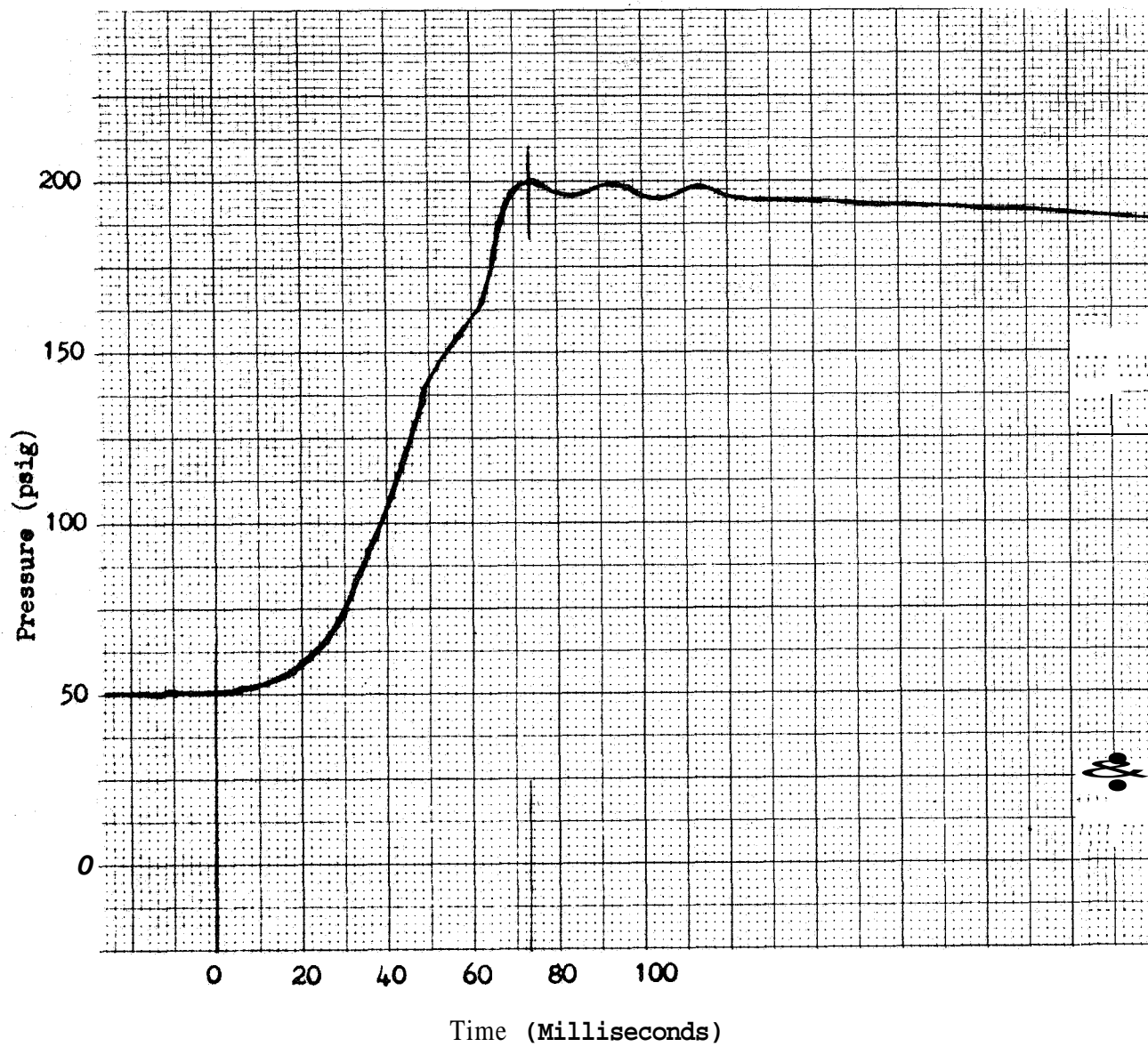


Figure 6-3. Typical Surge Test Waveform

SECTION VII

ICING TEST

7.1 TEST REQUIREMENTS

- 7.1.1 An icing test **shall** be conducted to determine the ability of the test specimen to perform under iced conditions.
- 7.1.2 The icing test **shall** be performed in accordance with section 14 of KSC-STD-164(D) .
- 7.1.3 The temperature in the test chamber shall be regulated and maintained at 5°F.
- 7.1.4 Spray nozzles shall emit water in droplets having a **minimum** diameter of 1.5 millimeters.
- 7.1.5 Water precooled to 40°F **shall** flow through each spray nozzle at a rate of approximately 2 gallons per minute.
- 7.1.6 Spray nozzles **shall** be located at a **minimum** distance of 2 feet from the specimen.
- 7.1.7 Functional tests shall be performed during and after the icing test.

7.2 TEST PROCEDURE

- 7.2.1 The specimen **was** installed in test setup as shown in figures 7-1 7-2 using the equipment listed in table 7-1.
- 7.2.2 All connections were tight, gages were installed and operating properly and all hand valves were closed.
- 7.2.3 Test chamber 15 **was** stabilized at a temperature of 5°F. Water at 40°F **was** then injected into the test chamber continuously until a **minimum** of 1/2-inch of ice had formed on the specimen.
- 7.2.4 LN₂ bath 7 **was** filled. Hand valve 3 and 12 were opened and the specimen **was** slightly opened. Regulator 6 **was** adjusted to an outlet pressure of 100 psig. The pressure **was** monitored on gage 8. When thermocouple 11 indicated a temperature of -320°F the specimen **was** closed. Regulator 6 **was** readjusted pressurizing the specimen inlet port to 100 psig **as** indicated on gage 8.
- 7.2.5 Hand valve 12 **was** closed and hand valve 14 **was** opened,
- 7.2.6 The specimen **was** **visually** inspected for external leakage (excessive frosting). Internal leakage **was** checked by monitoring leakage detector 16 for bubbles. No external or internal leakage **was** allowed. All data were recorded.
- 7.2.7 The specimen **was** pressurized to 200 psig by readjusting regulator 6 and monitoring the pressure on gage 8.

- 7.2.8 The specimen was checked for leakage at 200 psig as described in paragraph 7.2.5. No internal or external leakage was allowed. All data were recorded.
- 7.2.9 Leakage detector 16 was removed, hand valve 3 was closed, and regulator 6 was readjusted to zero outlet pressure. Hand valve 10 was opened venting the system and specimen.
- 7.2.10 The handwheel was removed from the specimen and torque wrench 13 was installed.
- 7.2.11 Hand valve 10 was closed and the procedure described in 7.2.4 was conducted.
- 7.2.12 The torque required to open and seat close the specimen was measured using torque wrench 13. The torque required to keep the stem moving was also measured. All data including leakage after specimen was seated were recorded.
- 7.2.13 Hand valve 3 was closed and hand valve 10 was opened and the specimen and system were vented.
- 7.2.14 The temperature of the environmental chamber was raised to ambient conditions.
- 7.2.15 Within 1 hour after completion of the icing test, the specimen was visually inspected for formation of ice on moving parts. A functional test as described in 7.2.4 through 7.2.12 was then conducted while maintaining the temperature at ambient conditions.

7.3 TEST RESULTS

- 7.3.1 The specimen developed excessive leakage at the stem and packing gland. Leakage developed at 5 psig inlet pressure during the icing functional test. The specimen was removed from the test setup and returned to ambient temperature. A functional test was performed, at 5 psig inlet pressure the stem packing gland continued to leak excessively. The stem packing gland was then tightened and a functional test was performed. No leakage was observed.
- 7.3.2 The specimen was reinstalled in the test setup and returned to icing conditions.
- 7.3.3 The specimen then demonstrated satisfactory operation during the icing functional test and post-icing functional test.

7.4 TEST DATA

The data presented in tables 7-2 through 7-6 were recorded during icing functional test and post-icing functional test.

Table 7-1. Icing Test Equipment List

Item No.	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
1	Test Specimen	Alloy Steel Products co.	FIG. G 217-E		3-inch, 150-psig gate valve
2	GN ₂ Pressure Source	CCSD	N/A	N/A	0-to 300-psig
3	Hand Valve	Robbins	SSKG-250-4T	N/A	1/4-inch
4	Filter	Bendix	17312 60	N/A	2-micron
5		Heise	H35830	N/A	0-to 500-psig ±0.5% FS Cal date 11-10-66
6	Regulator	Tescom	26-1023	1038	0-to 5000-psig inlet 0-to 300-psig outlet
7	LN ₂ Bath	CCSD	NA	N/A	
8	Gage	Heise	H-35842	N/A	0-to 500-psig ±0.5% FS Cal date 11-10-66
9	Relief Valve	Anderson Greenwood	81B-66-6	2364-S	1/2-inch
10	Hand Valve	Hydromatic	NA	N/A	1/4-inch
11	Thermocouple	West	IE-S33	N/A	Cal date 10-31-66
12	Hand Valve	Flowmatic	NA	N/A	1/4-inch
13	Torque Wrench	NA	NA	N/A	
14	Hand Valve	Flowmatic	NA	N/A	1/4-inch
15	Icing Chamber	CCSD	NA	N/A	
16	Leak Detector	CCSD	NA	N/A	50-cc beaker

Table 7-2. Functional Test Data at Icing Conditions (Stem Packing Gland Leakage)

Checks	Inlet pressure	Results
External leakage	100-psig/GH ₂	Excessive stem leakage at 5-psig. All other checks not performed.
External leakage	200-psig/GH ₂	
Internal leakage	100-psig/GH ₂	
Internal leakage	200-psig/GH ₂	
Opening torque	200-psig/LN ₂	
Seating torque	200-psig/LN ₂	
Stem running torque	200-psig/LN ₂	

Checks	Inlet Pressure	Results
External leakage	100-psig/GH ₂	Excessive stem leakage at 5-psig.
External leakage	200-psig/GH ₂	
Internal leakage	100-psig/GH ₂	All other checks not performed
Internal leakage	200-psig/GH ₂	
Opening torque	200-psig/LN ₂	
Seating torque	200-psig/LN ₂	
Stem running torque	200-psig/LN ₂	

Table 7-4. Functional Test Data After Tightening Packing Gland

Checks	Inlet pressure	Results
External leakage	100-psig/GH ₂	None
External leakage	200-psig/GH ₂	None
Internal leakage	100-psig/GH ₂	None
Internal leakage	200-psig/GH ₂	None
Opening torque	200-psig/LN ₂	15 ft/lb
Seating torque	200-psig/LN ₂	19 ft/lb
Stem running torque	200-psig/LN ₂	1 ft/lb

Table 7-5, Icing Functional Test Data During Icing Conditions

Checks	Inlet pressure	Results
External leakage	100-psig/GH ₂	None
External leakage	200-psig/GH ₂	None
Internal leakage	100-psig/GH ₂	None
Internal leakage	200-psig/GH ₂	None
Opening torque	200-psig/LN ₂	10 ft/lb
Seating torque	200-psig/LN ₂	12 ft/lb
Stem running torque	200-psig/LN ₂	1 ft/lb

Table 7-6. Post-Icing Functional Test Data

Checks	Inlet pressure	Results
External leakage	100-psig/GH ₂	None
External leakage	200-psig/GH ₂	None
Internal leakage	100-psig/GH ₂	None
Internal leakage	200-psig/GH ₂	None
<i>Opening torque</i>	200-psig/LN ₂	12 ft/lb
Seating torque	200-psig/LN ₂	15 ft/lb
Stem <i>running</i> torque	200-psig/LN ₂	1 ft/lb

Note: *ALL* lines $\frac{1}{4}$ inch unless otherwise indicated.
Refer to table 7-1 for item identification.

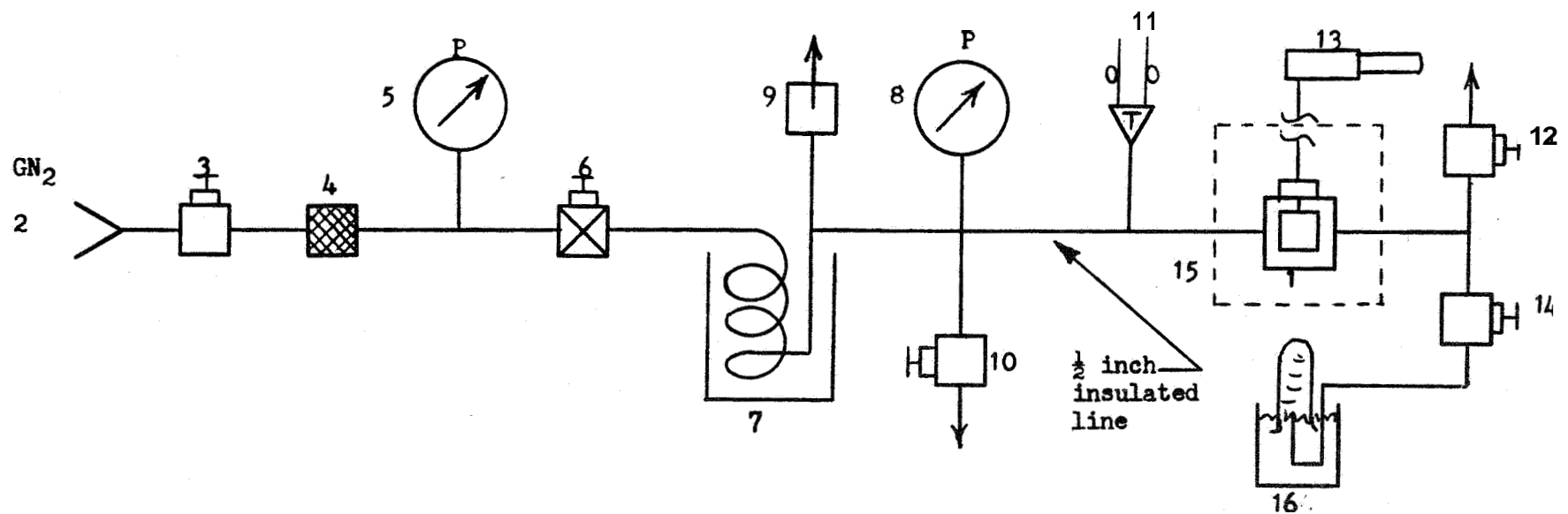


Figure 7-1. Icing Test Schematic

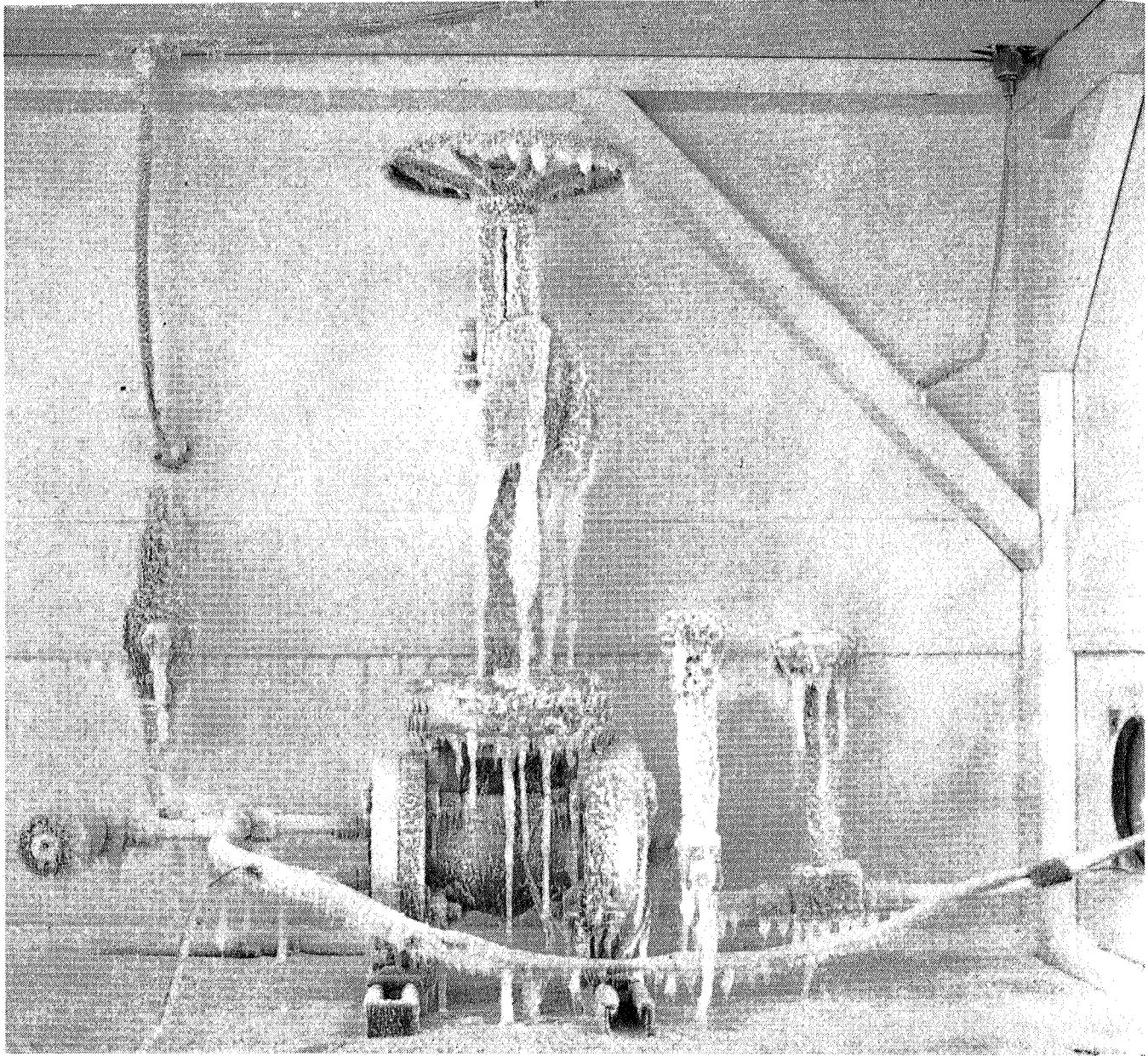


Figure 7-2. Icing Test Setup

SECTION VIII

SAND AND DUST TEST

8.1 TEST REQUIREMENTS

- 8.1.1 A sand and dust test shall be performed to determine the resistance of the test specimen to fine, blowing sand and dust particles,
- 8.1.2 The sand and dust test shall be conducted in accordance with KSC-STD-164(D) .
- 8.1.3 All of the ports of the test specimen shall be capped during exposure to the sand and dust environment,
- 8.1.4 A functional test shall be performed after the completion of this test.

8.2 TEST PROCEDURE

- 8.2.1 The sand and dust test was conducted in accordance with Section 16 of Specification KSC-STD-164(D) ,
- 8.2.2 The specimen was placed in a sand and dust test chamber, The chamber temperature was increased to and maintained at +77°F for a period of two hours. At the completion of this two hour period, the chamber temperature was increased to and maintained at +160°F for an additional two hour period, The chamber temperature was then returned to room ambient temperature,
- 8.2.3 Throughout the entire sand and dust test, the sand and dust density within the chamber was maintained between 0.1 and 0.5 gram per cubic foot and the sand and dust velocity was maintained between 100 and 500 feet per minute. The sand and dust used in the test was of an angular structure having the characteristics described in Specification KSC-STD-164(D) .
- 8.2.4 At the completion of the sand and dust test, the specimen was removed from the chamber and allowed to cool to room ambient temperature. The accumulated dust was removed from the specimen by wiping and the specimen was then visually examined for evidence of deterioration,

8.3 TEST RESULTS

- 8.3.1 Visual examination of the specimen at the completion of the sand and dust test revealed no evidence of deterioration.
- 8.3.2 The specimen demonstrated satisfactory operation during post-sand and dust functional test.

8.4 TEST DATA

The data presented in table 8-2 were recorded during post-sand and dust functional test.

Table 8-1. Sand and Dust Test Equipment List

Item No.	Item	Manufacturer	Model/Part No.	Serial No.	Remarks
1	Test Specimen	Alloy Steel Products Co,	F. 2		3-inch, 150-psig gate valve
2	Sand and Dust	Associated Test Laboratories, Inc ,	SD-36-LC	N/A	As specified in KSC-STD-164(D) Cal date 1-25-67

Table 8-2. Post-Sand and Dust Functional Test Data

Checks	Inlet pressure	Results
External leakage	100-psig/GH ₂	None
External leakage	200-psig/GH ₂	None
Internal leakage	100-psig/GH ₂	None
Internal leakage	200-psig/GH ₂	None
Opening torque	200-psig/LN ₂	22 ft/lb
Seating torque	200-psig/LN ₂	30 ft/lb
	200-psig/LN ₂	1 ft/lb

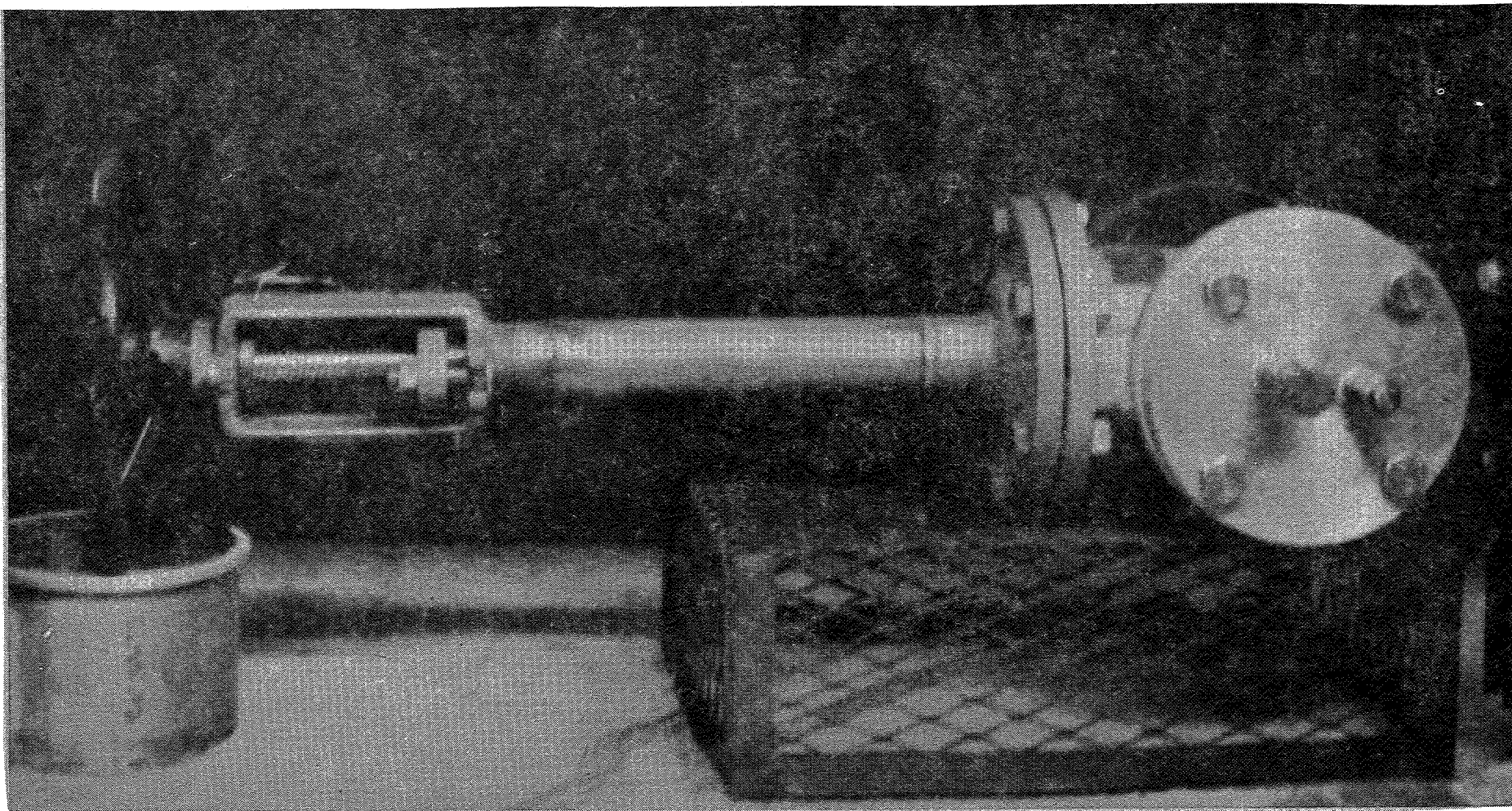


Figure 8-1. Sand and Dust Test Setup

Table 9-1. Salt Fog Test Equipment List

Item No.	Item	Manufacturer	Model/Part No.	Serial No.	Remarks
1	Test Specimen	Alloy Steel Products co.	FIG. C-217-EB		3-inch, 150-psig gate valve
2	Salt Fog Chamber	Industrial Filter & Pump Mfg. co.	411.1C	08-U3-004372	As specified in KSC-STD-164(D)

Table 9-2. Post-Salt Fog Functional Test Data

Checks	Inlet pressure	Results
External leakage	100-psig/GH ₂	None
External leakage	200-psig/GH ₂	None
Internal leakage	100-psig/GH ₂	None
Internal leakage	200-psig/GH ₂	None
Opening torque	200-psig/LN ₂	14.5 ft/lb
Seating torque	200-psig/LN ₂	19 ft/lb
Stem running torque	200-psig/LN ₂	2 ft/lb

SECTION IX

SALT FOG TEST

9.1 TEST REQUIREMENTS

- 9.1.1 The salt fog test shall be performed to determine the resistance of the test specimen to a salt atmosphere.
- 9.1.2 The salt fog shall be performed in accordance with KSC-STD-164(D).
- 9.1.3 The test specimen shall be exposed to the salt fog for 240 hours (\pm hours). All ports of the test specimen shall be capped during exposure to the salt atmosphere.
- 9.1.4 A functional test shall be performed upon completion of the salt fog test.

9.2 TEST PROCEDURE

- 9.2.1 The specimen was Visually inspected for corrosion, dirt, and oily films. Oily films other than those required for normal service usage and all dirt particles were removed. The specimen was placed in the salt fog chamber.
- 9.2.2 The temperature in the exposure zone was maintained at 95 (+2,-4)°F. The salt fog conditions in the exposure zone were maintained so that a clean fog-collecting receptacle placed at any point in the exposure zone will collect from 0.5 to 3 milliliters of salt solution per hour for each 80 square centimeters of horizontal collecting area (10 centimeters diameter), based on an average test of at least 16 hours. The salt solution consisted of five parts by weight of sodium choride and 95 parts by weight of water.
- 9.2.3 The specimen was exposed to the salt fog conditions for 240 hours (\pm 2 hours).
- 9.2.4 Upon completion of the exposure test, the specimen was removed from the chamber and salt deposits were removed from the specimen to the extent necessary to make mechanical connections. Within 1 hour after completing the exposure period, a functional test as specified in section IV was performed.

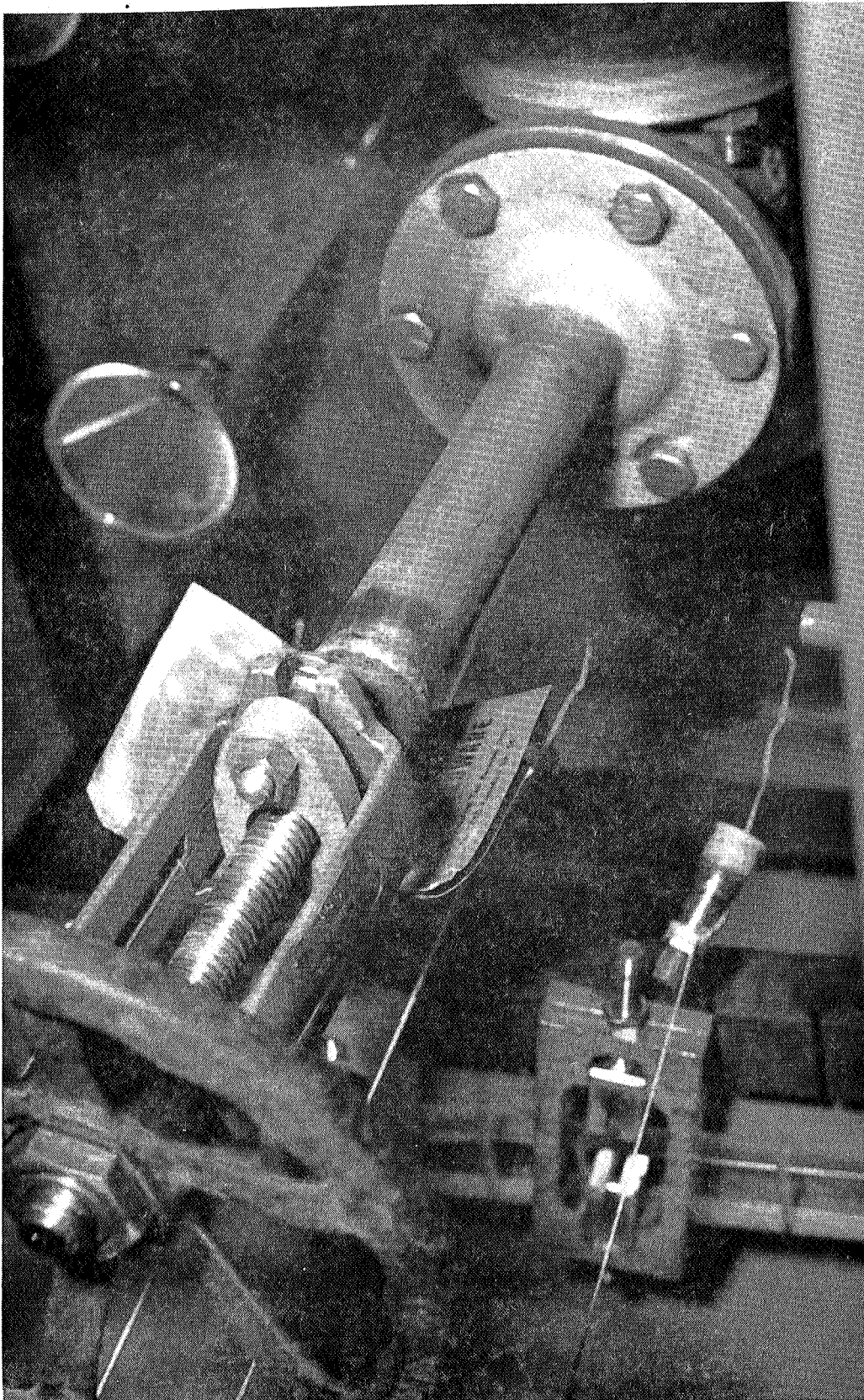
9.3 TEST RESULTS

The specimen demonstrated satisfactory operation during the post-salt fog functional test.

9.4 TEST DATA

The data presented in table 9-2 were recorded during the post-salt fog functional test.

Figure 9-1. Salt Fog Test Setup



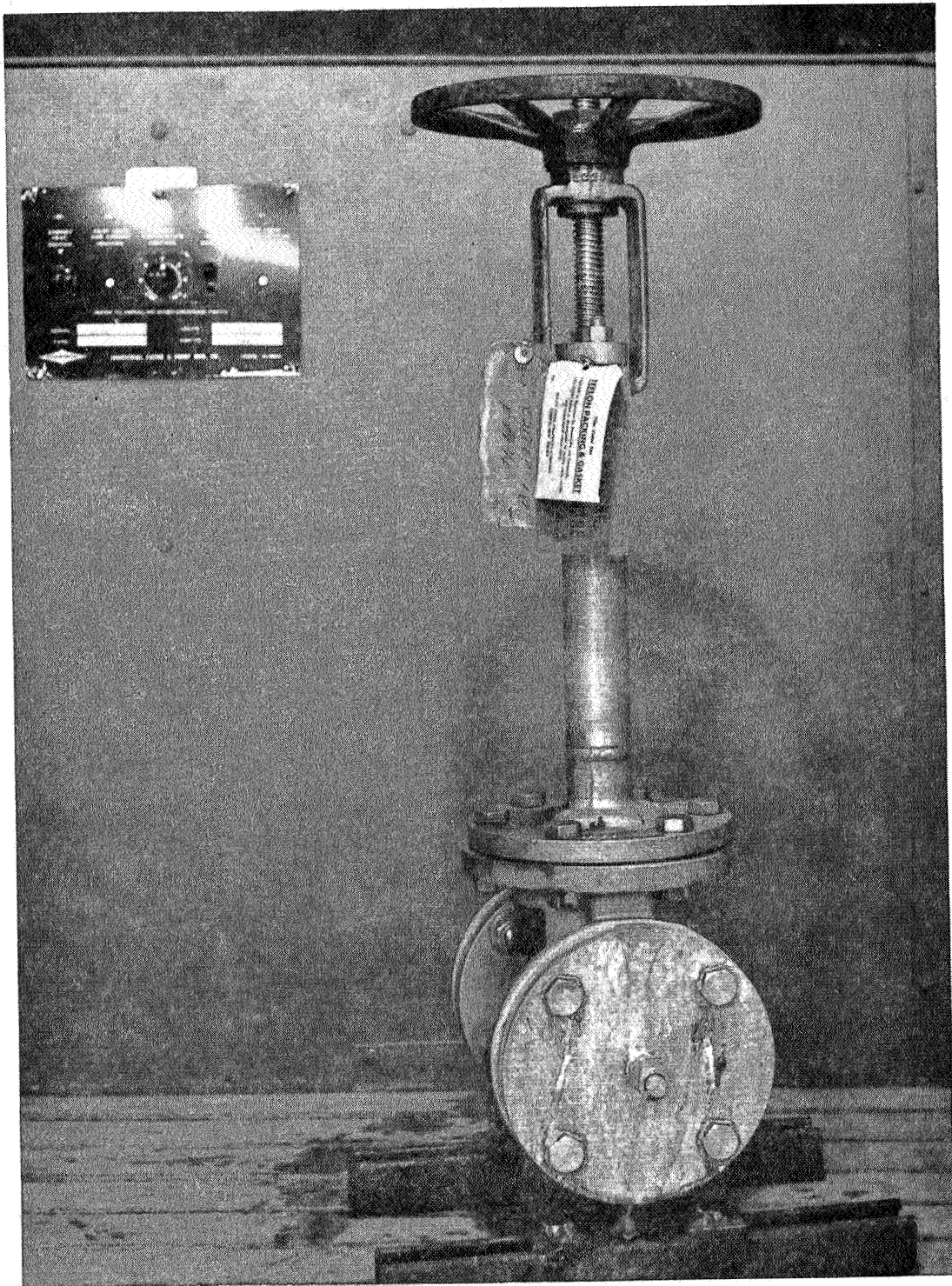


Figure 9-2 Specimen after Salt Fog Test

SECTION X

CYCLE TEST

10.1 TEST REQUIREMENTS

- 10.1.1 The test specimen shall be pressurized with LN₂ to 200 psig and shall be cycled 100 times from the fully closed to the fully opened position and then to the fully closed position.
- 10.1.2 A functional test as specified in section IV shall be performed after 100, 500, and 1000 cycles.

10.2 TEST PROCEDURE

- 10.2.1 The specimen was installed in the test setup as shown in figures 10-1 and 10-2 using the equipment listed in table 10-1.
- 10.2.2 All connections were tight, gages were installed and operating properly, and all hand valves were closed.
- 10.2.3 LN₂ tank 7 was filled. Hand valve 3 was opened and regulator 5 was adjusted to 50 psig and LN₂ tank 7 was pressurized. The pressure was monitored on gage 6. The specimen and hand valve 8 were opened. Hand valve 9 was slightly opened allowing a small bleed through the specimen.
- 10.2.4 When LN₂ was flowing through the bleed, regulator 5 was readjusted until gages 6 and 10 indicated 200 psig. LN₂ was maintained in the specimen by adjusting the bleed rate with hand valve 9.
- 10.2.5 The specimen was cycled from the fully opened to the fully closed position and back to the fully opened position 1000 times.
- 10.2.6 A functional test as specified in section IV was performed after 100, 500, and 1000 cycles.

10.3 TEST RESULTS

The specimen demonstrated satisfactory operation during the cycle test and cycle functional tests after 100, 500 and 1000 cycles.

10.4 TEST DATA

The data presented in tables 10-2 through 10-4 were recorded during cycle functional tests after 100, 500 and 1000 cycles.

Table 10-1. Cycle Test Equipment List

Item No	Item	Manufacturer	Model/ Part No.	Serial No.	Remarks
1	Test Specimen	Allay Steel Products Co.	FIG. C-217-EB		3-inch, 150-psig gate valve
2	GN ₂ Pressure Source	CCSD	N/A	N/A	0-to 300-psig
3	Hand Valve	Robbins	SSKG--	N/A	1/4-inch
4	Filter	Bendix	2-S-13460-16-13-0	N/A	2-micron
5	Regulator	Tescom	26-1023	1038	0-to 3000-psig inlet 0-to 500-psig outlet
6	Pressure Gage	Duragage	N/A	NASA	0-to 5000 0-psig ±0.5% FS Cal date 2-9-67
7	LN ₂ Tank	Ronan & Kunzi Inc.	LOX-13	N/A	
8	Hand Valve	Control Components	ES-608-RP	N/A	1/2-inch
9	Hand Valve	Control Components	ES-6004-PB	N/A	1/4-inch
10	Pressure Gage	Duragage	N/A	NASA	0-to 600-psig ±0.5% FS Cal date 2-9-67

Table 10-2, Cycle Functional Test **Data** After 100 Cycles

Checks	Inlet pressure	Results
External leakage	100-psig/GH ₂	None
External leakage	200-psig/GH ₂	None
Internal leakage	100-psig/GH ₂	None
Internal leakage	200-psig/GH ₂	None
Opening torque	200-psig/LN ₂	16 ft/lb
Seating torque	200-psig/LN ₂	17 ft/lb
Stem running torque	200-psig/LN ₂	2 ft/lb

Table 10-3. Cycle Functional Test **Data** After 500 Cycles

Checks	Inlet pressure	Results
External leakage	100-psig/GH ₂	None
External leakage	200-psig/GH ₂	None
Internal leakage	100-psig/GH ₂	None
Internal leakage	200-psig/GH ₂	None
Opening torque	200-psig/LN ₂	14 ft/lb
Seating torque	200-psig/LN ₂	20 ft/lb
Stem running torque	200-psig/LN ₂	2 ft/lb

Table 10-4. Cycle Functional Test Data After 1000 Cycles

Checks	Inlet pressure	Results
External leakage	100-psig/GH ₂	None
External leakage	200-psig/GH ₂	None
Internal leakage	100-psig/GH ₂	None
Internal leakage	200-psig/GH ₂	None
Opening torque	200-psig/LN ₂	14 ft/lb.
Seating torque	200-psig/LN ₂	22 ft/lb.
Stem running torque	200-psig/LN ₂	2 ft/lb.

Note: All lines $\frac{1}{2}$ inch.
 Refer to table 10-1 for item identification.

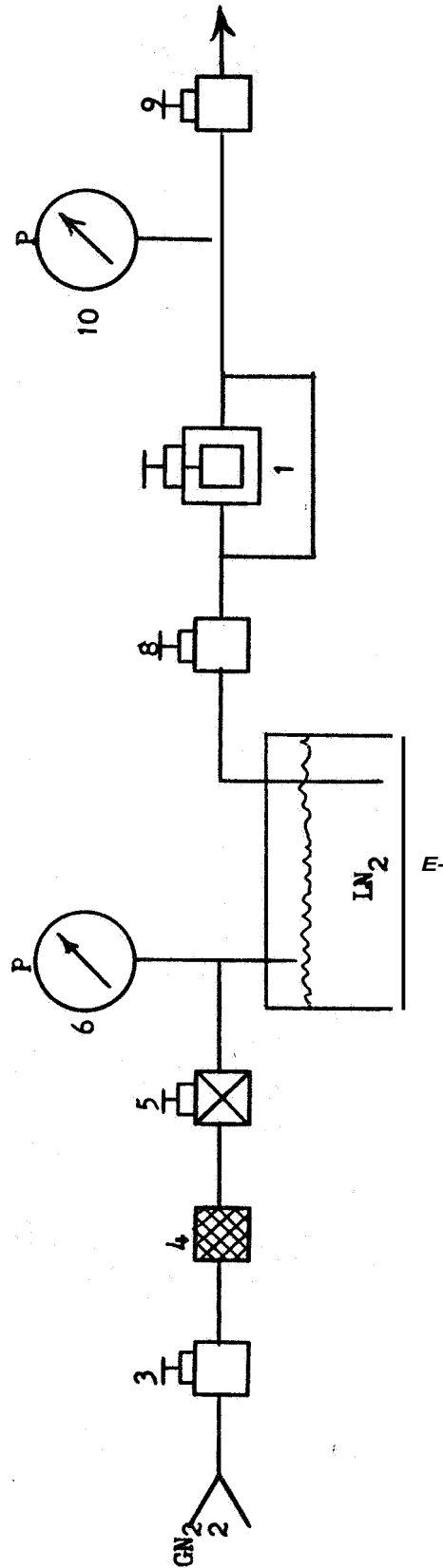


Figure 10-1. Cycle Test Schematic

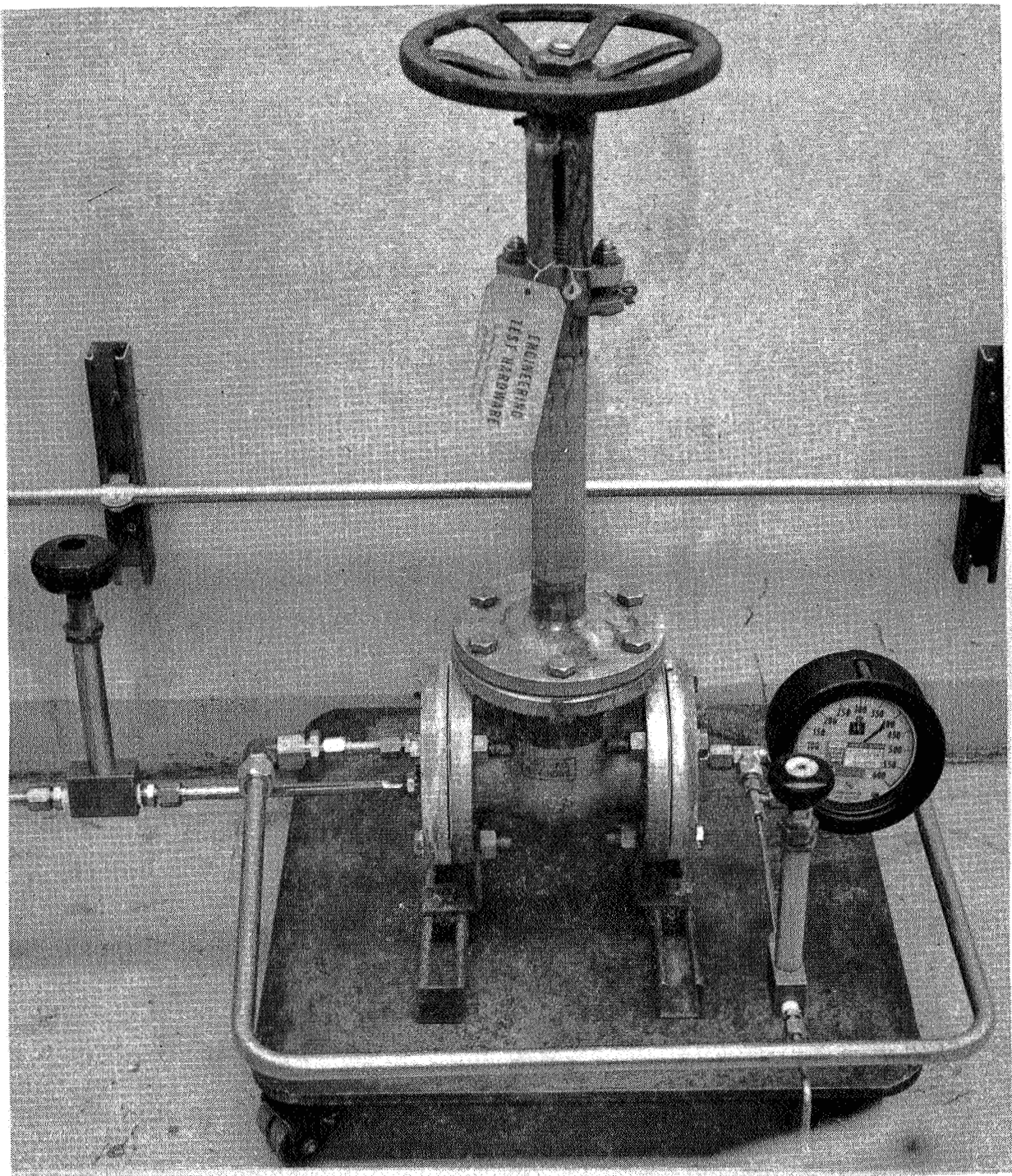


Figure 10-2. Cycle Test Setup

SECTION XI

BURST TEST

11.1 TEST REQUIREMENTS

- 11.1.1 The test specimen shall be placed in the closed position and the inlet port hydrostatically pressurized to 800 psig. The specimen shall be checked for distortion.
- u.1.2 The specimen shall be placed in the closed position and both ports shall be simultaneously hydrostatically pressurized to 800 psig for 5 minutes. The specimen shall be checked for distortion.
- 11.1.3 The test specimen shall be hydrostatically pressurized until failure occurs. Record the pressure and location of the failure and photograph the failure.

11.2 TEST PROCEDURE

- 11.2.1 The specimen was installed in the test setup as shown in figures 11-1 and 11-2 using the equipment listed in table 11-1.
- 11.2.2 All connections were tight, gages were installed operating properly, and all hand valves were closed,
- 11.2.3 The specimen was placed in the fully closed position and hand valve 4 was opened. Hand pump 3 was operated, and the specimen was pressurized to 800 psig. Hand valve 4 was closed and gage 5 was monitored
- 11.2.4 Hand valves 6 and 7 were opened and the pressure was vented to zero psig. The specimen was inspected for distortion,
- 11.2.5 Hand valve 6 was closed and hand valve 4 was opened. Hand pump 3 was operated and the specimen was pressurized to 800 psig and maintained for 5 minutes. The pressure was monitored on gage 5.
- 11.2.6 Hand valve 4 was closed and hand valve 7 was opened and the specimen was vented to zero psig. The specimen was inspected for distortion.
- 11.2.7 Hand valve 4 was opened and hand valve 7 was closed. Hand pump 3 was operated and the specimen was pressurized until failure occurred. Gage 5 was monitored.

11.3 TEST RESULTS

- 11.3.1 No evidence of leakage or distortion was observed when the specimen was pressurized to a pressure of 800 psig for 5 minutes,
- 11.3.2 The specimen inlet gasket failed at a pressure of 3300 psig. The specimen showed no evidence of distortion.

11.4 TEST DATA

The data presented in table 11-2 were recorded during the burst test.

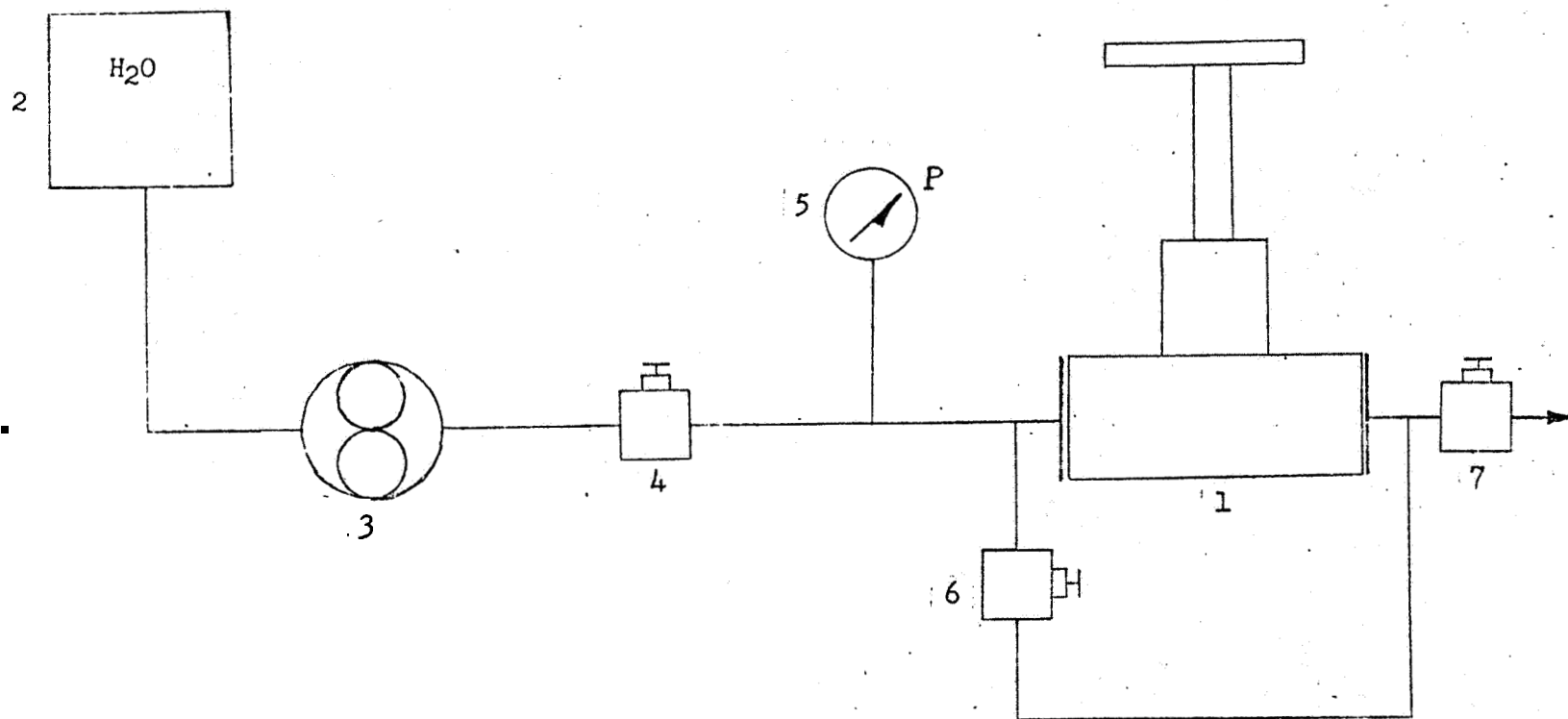
Table 11-1. Burst Test Equipment List

Item No.	Item	Manufacturer	Part No.	Serial No.	Remarks
1	Test Specimen	Alloy Steel Products co.	FIG. C-217-EB	NA	3-inch, 150-psig gate valve
2	H ₂ O Reservoir	CCSD	NA	NA	
3		Pressure Products Industries	NA	K750	
4	Hand Valve	Robbins	SSKG-250-4T	NA	1/4-inch
5	Pressure Gage	Heise	H-41042	106444	0-to 3500-psig ± 0.1% FS Cal date 2-14-67 1/4-inch
6	Hand Valve	Robbins	SSKG-250-4T	NA	1/4-inch
7	Hand Valve	Robbins	SSKG-250-4T	NA	1/4-inch

Table 11-2. Burst Test Data

Pressure	<p>Inlet port. - 800 psig Both inlet and outlet ports - 800 psig for 5 minutes</p> <p>Both inlet and outlet ports - 3300 psig</p>
Leakage	At 3300 psig inlet flange gasket started leaking
Distortion	None

11-3
11-4



Note: All lines 1/4 inch.
Refer to table 11-1 for item identification.

Figure 11-1. Burst Test Schematic

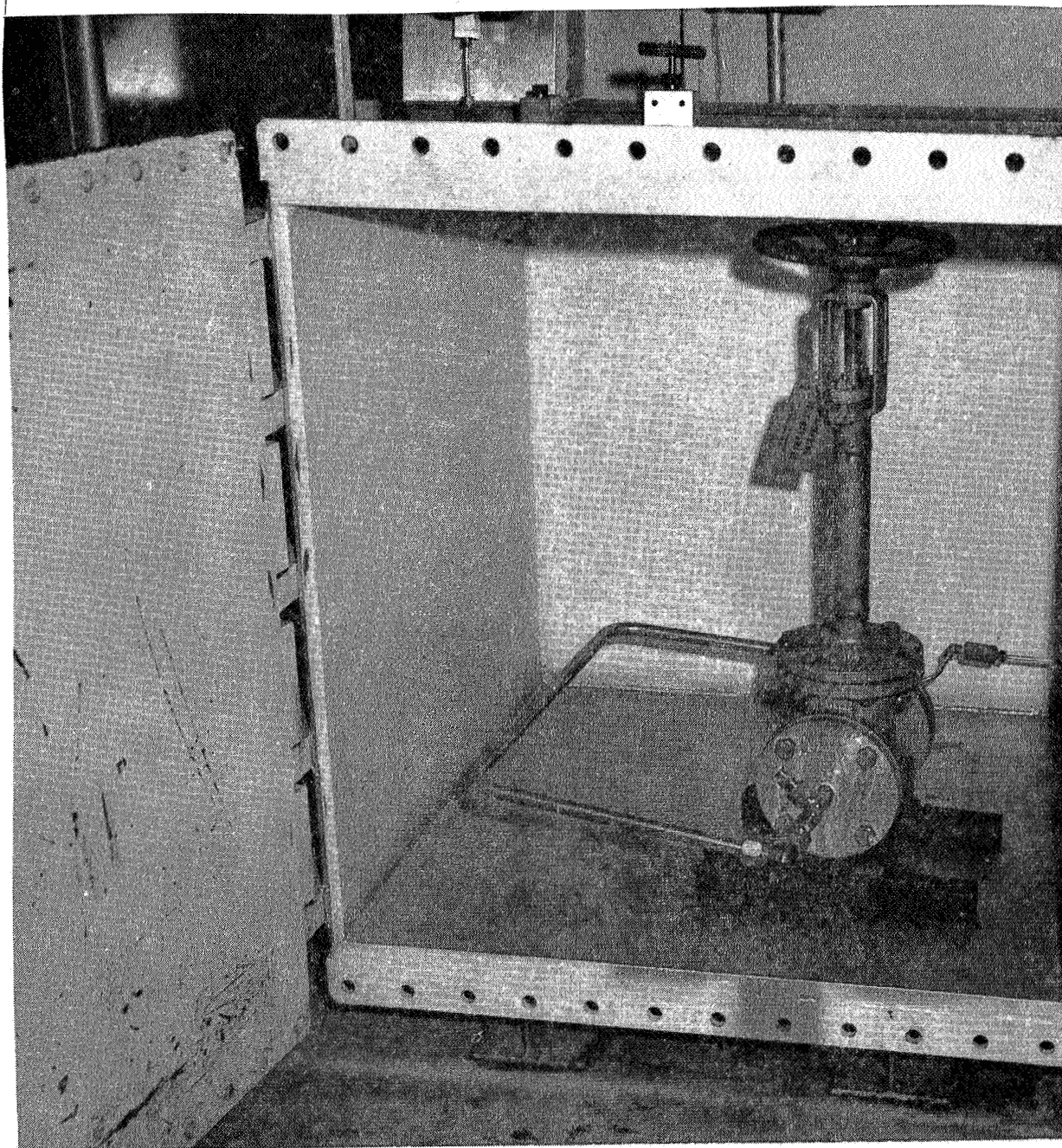


Figure 11-2. Burst Test Setup

APPENDIX

Test Report No. M180-7512

No of Pages 2

Report of Test on

VALVE

SAND AND DUST TEST

for

CHRYSLER CORPORATION

Associated Testing Laboratories, Inc.

Wayne, New Jersey

Date February 25, 1967

	Prepared	Checked	Approved
By	J. Perzel	W. Payne	G. Ciccone
Signed	<i>J. Perzel</i>	<i>W. Payne</i>	<i>G. Ciccone</i>
Date	<i>2-25-67</i>	<i>2-27-67</i>	<i>2-27-67</i>

TEST PROCEDURE

The sand and dust test was conducted in accordance with Section 16 of Specification KSC-STD-164(D).

The Valve was placed in a sand and dust test chamber. The chamber temperature was increased to and maintained at 477°F for a period of two hours. At the completion of this two hour period, the chamber temperature was increased to and maintained at +160°F for an additional two hour period. The chamber temperature was then returned to room ambient temperature.

Throughout the entire sand and dust test, the sand and dust density within the chamber was maintained between 0.1 and 0.5 gram per cubic foot and the sand and dust velocity was maintained between 100 and 500 feet per minute. The sand and dust used in the test was of an angular structure having the characteristics described in Specification KSC-STD-164(D).

At the completion of the sand and dust test, the Valve was removed from the chamber and allowed to cool to room ambient temperature. The accumulated dust was removed from the Valve by wiping and the Valve was then visually examined for evidence of deterioration.

APPARATUS

Sand and Dust Chamber, manufactured by Associated Testing Laboratories, Inc., Manufacturing Division, Model SD-36-IC.

Calibration Date: 1-25-67

Calibration Due Date: 3-25-67

TEST RESULTS

Visual examination of the Valve at the completion of the sand and dust test revealed no evidence of deterioration.

Report No. M180-7512

Page a

Associated Testing Laboratories, Inc.

Wayne, New Jersey

Burlington, Massachusetts

Administrative Data

1.0 Purpose of Test:

To subject the submitted Valve to a sand and dust test in accordance with the referenced specification.

2.0 Manufacturer:

Chrysler Corporation
Space Division
Michoud Operations
New Orleans, Louisiana 70129

3.0 Manufacturer's Type or Model No.:

P/N 75M04047-HGV-1
M/N C-217-EB

4.0 Drawing, Specification or Exhibit:

Specification KSC-STD-164 (D)
dated September 12, 1964

5.0 Quantity of Items Tested:

One

6.0 Security Classification of Items:

Unclassified

7.0 Date Test Completed:

February 16, 1967

8.0 Test Conducted By: **Associated Testing Laboratories, Inc.**

9.0 Disposition of Specimens:

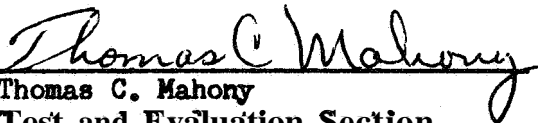
Returned to
Chrysler Corporation

10.0 Abstract:

There was no evidence of deterioration of the Valve as a result of the sand and dust test.


APPROVAL
TEST WORT
FOR
HAND OPERATED GATE VALVE
3-INCH, 150- PSIG
Alloy Products Company FIG. C-217-EB
NASA Drawing Number 75MO4047 HGV-1

SUBMITTED BY:


Thomas C. Mahony
Test and Evaluation Section

APPROVALS


R. W. Claunch
Program Supervisor


V. J. Venko, Director
Engineering Department

DISTRIBUTION

Chrysler Corporation Space Division

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